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Our 1932 Job

ONE THIRD of the products now manufactured in the United States were unheard of when this magazine first saw the light of day in 1877. Just to list the newcomers would tax the capacity of a 1932 model typewriter. And still newer newcomers seem to be springing up without any special urging. The best part of it is that they all must be manufactured before they can be sold and that most of them will have to depend upon the men of the machinery and metal-working industry to do the lion's share of the job.

Last year at this time we took pains to gather together and publish various opportunities for our industry. From "Opportunities in Architecture" to opportunities in the process industries we tried to hit the highest spots of several broad fields. This year we have taken equal pains to assemble a group of articles which may be roughly classified under the heading of new methods. We believe you will find them valuable.

After all, the calendar year does not adequately measure the distance traveled from last year to this; in our opinion we are face to face with a different set of conditions. The problem is not so much what to manufacture, but how to manufacture at a profit.

This is the machine age—little question of that. Long-haired men and short-haired women have written volumes on how the skill of men has been transferred to mechanisms until men have little or nothing left to do. But those who are in closest touch, and are in best position to judge, know that highly skilled and intelligent men are more necessary than ever before.

The number of available machines and methods is indeed staggering; the executive, from factory manager to foreman, and the engineer must have requisite knowledge to make intelligent choices. The operative must be acquainted with the hows and whys and fine points of many machines and methods, new and old, or face the possibility of joining the gray ranks of the unemployed when his old machine is superseded by a new model or a brand new method.

Our 1932 job, as we see it, is to provide you with the best possible data on new methods right through the year. If at any time you think that *American Machinist* should publish even more data on a given subject, please write the editors. You will be doing the greatest possible service to yourself and to your own industry.

Metal Rolling in Mass Production

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Once the merits and economies of cold rolling are recognized, the process will be more widely adopted. The author has been prevailed upon to summarize the art as practiced in England

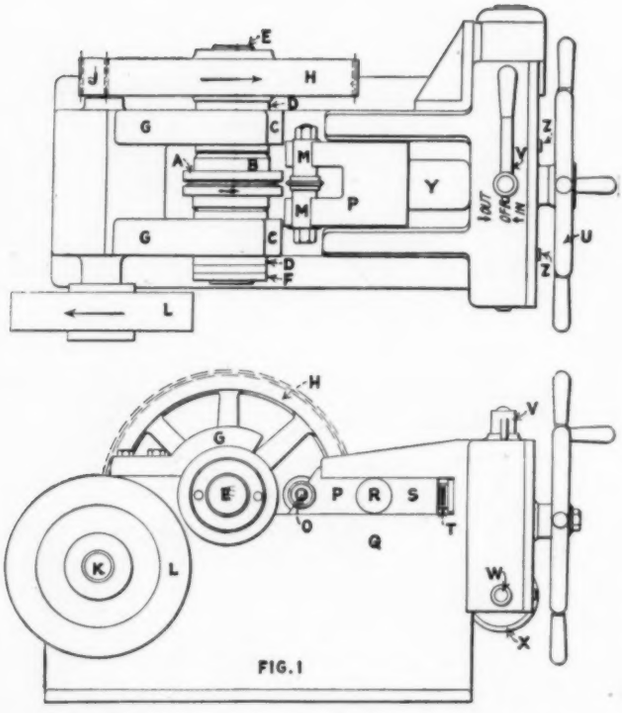

Fig. 1—Machines to roll castings and heavy forgings require but a single roll. The work is held on a mandrel

ECONOMIC production is the goal of all production engineers. For years their efforts have been concentrated on devising new machines and methods whereby this end may be attained. Thus, we have a steady stream of new machines placed upon the market that either do the job in half the previous time, or do the skilled man's work without the expense of his hire. Most production machines are designed to save either time or wages; only on rare occasions is economy of material the aim of the designer.

Cold rolling machines, however, are designed to produce with a minimum of scrap since they operate on the principle of plastic flow. It is remarkable how really little is known about them.

As the name implies, cold rolling means the production of articles of cylindrical section by the process of rolling a casting, a tube, or a rod between two rollers, or by rotating them and simultaneously forcing them into close contact with a single rotating roller. The contact in either instance causes a change in the plastic condition of the metal under stress that varies with pressure applied, speed of recurring contacts of each particle of the work and roller, and time taken. The nature of the material worked also has an influence on the results attained. It is obvious that it would be futile to attempt to roll work that is itself harder than the rolls employed to roll it, even as it would be futile to attempt to roll a non-plastic material.

Fig. 2 shows one of the easiest operations in plastic rolling. An aluminum blank 4½ in. in diameter is split, flattened and curved in three operations of 40 sec. each. The rollers in this case are simple and are what may be called stock or standard tools. The splitting roller may be used for a variety of purposes. The second operation roller is flat, and the curling is done by two disks held apart by a spacer. The hand wheel comes from the roll burnished and uniform in size. Contrast this with the operations necessary in the usual casting method.

The job in Fig. 3 is a 2 per cent nickel-steel sprocket wheel. It is an illustration of the saving that can be

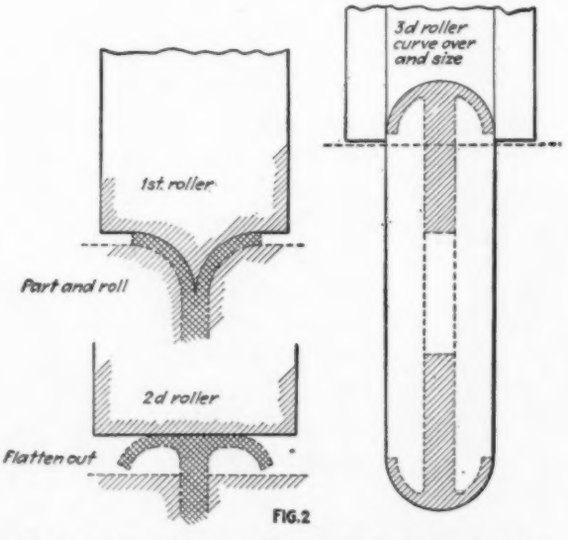

Fig. 2—Two minutes suffice to roll this handwheel from an aluminum blank. Rolling replaces casting, cleaning, turning, polishing and buffing

made by the process on work appropriate to it. Originally, the sprocket was drop-forged and required 900 lb. of material per 1,000 pieces. The output of the hammer was 85 pieces per hour, with 16 machine operations following. For rolling, the material requirements were 560 lb. per 1,000. The parts were blanked at the rate of 85 per min., the roll produced at the rate of 120 per hour with only two subsequent operations. The saving on material was 35 per cent and that on labor much more. The roller is made in two pieces, as is the custom whenever possible. In this case the two halves have a 1-deg. taper on their inner faces to insure close contact at *X*. The sleeves *D* on the mandrel *E* perform a triple function. They act as clamps to hold the part, they limit the area of plastic flow, and finally, with their close fit on the mandrel and their function of forming a support for the rim of the sprocket, they guarantee that the center hole will be concentric with the outside diameter of the sprocket. Any variation caused by excess or lack of material will show itself in the width of the rim, an unimportant dimension.

The round belt pulley shown in Fig. 4 is somewhat similar to the job in Fig. 2 except that accuracy is required and the work is wholly confined. The 12-in. roller used, is made in three parts—*A*, *B* and *C*. The clamping sleeves *D* form sizing plugs for the taper wings of the pulley, and assure concentricity. It is evident that the roller parts *A* and *C* could be dispensed with, but a burring operation on both edges would then be required. As made, it requires no additional operations.

The Rolling Machine also Assembles

Not only does the rolling machine take over some machining and foundry operations advantageously, but it also has its field in assembling work. Fig. 5 shows a trolley contactor wheel assembled by rolling. The mandrel and clamping plugs are somewhat smaller in this case, but are strengthened by extending the sleeves through the bearings. One of part *A* and two of part *B* are assembled and rolled as shown. In some cases the wheels are "grounded" wheels, in other cases a strip of

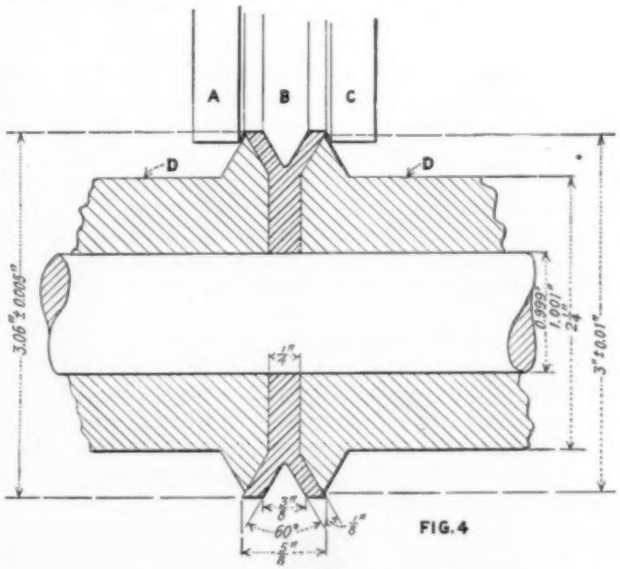

Fig. 4—A round-belt V-pulley is a good example of plastic flowing. The finished part is burnished and requires no further operations

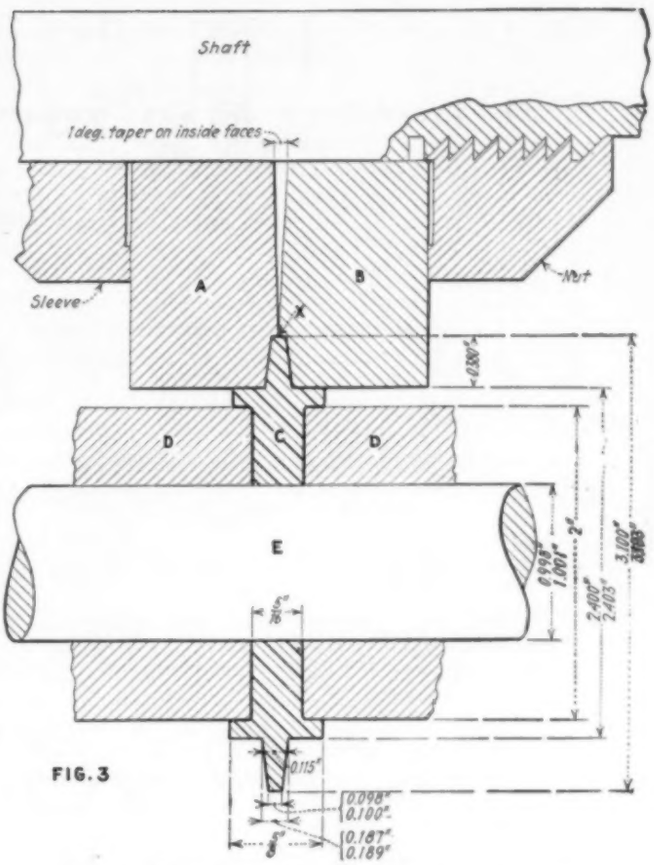

Fig. 3—Plastic forming applied to a 2 per cent nickel-steel gear blank. Any plastic metal not harder than the rolls themselves can be rolled

insulating material is inserted as shown. The part of *A* in the middle of the wheel is, of course, stretched, and it is necessary to take this into account in dimensioning *A*. The insulation must also be assembled in such a manner that the rolling will not stretch and break it.

The rolling process is also useful in the replacement of accurate circular tools. In some cases, as in Fig. 6, it gives a finish and uniformity difficult to secure otherwise. The illustration shows a beading roll for tin cans. The groove in this roll must be accurate and highly polished. A cutting tool $\frac{1}{16}$ in. wide has a tendency to chatter, and when the slot is finally polished, we often find that it is oversize and unsymmetrical. Rolling gives a highly burnished accurate job in less time.

The fact that the size of the holding mandrel may, in some cases, be quite small brings up the question of how much pressure is necessary to roll an impression.

Pressures Required for Rolling

On the 12-in. machines the calculated pressure is approximately 4,000 lb. total pressure (not lb. per sq.in.), with an infeed of 0.002 in. per revolution. On the machine with an 8-in. roller the pressure rarely exceeds 400 lb. total pressure. This small amount, as compared to other methods of causing plastic flow, is explained by the fact that, proportionally, the amount of force required increases at a much greater rate than the increased plastic flow required of the material. Thus, if twice the amount of material is to be replaced in the same length of time, it will require considerably more than twice the force to do the work. No comparison

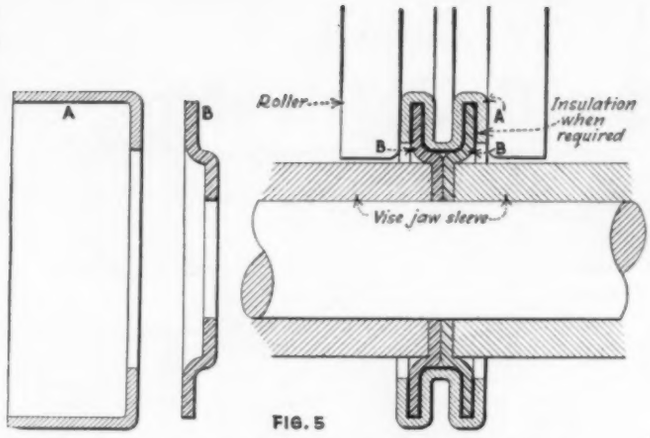

Fig. 5—A trolley wheel fully assembled on the roll. This operation is one of many that may be performed by rolling

can be made to other methods such as forging or swaging because in this case we have practically a line contact of work. The question of work hardening also enters and annealing must, at times, be resorted to.

We now come to a different type of machine and a different class of work. The machine is called a Differential Duplex roller. In this machine two rollers are used, sometimes with identical faces and at other times with different faces. The principle upon which this machine works is shown in Fig. 7. Similarity in appearance to the centerless grinder will be noted. The operation is the same, and in fact this machine was the forerunner of the centerless grinder. With this type of machine, the parts to be formed can be sheared off and fed to the rolls automatically by a hopper feed, at the rate of 60 to 80 pieces per minute, depending, of course, upon the nature of the work. No mechanical means is necessary to force them through the rollers; when they are to size they drop through. No inspection for size is necessary afterward. In the illustration, *A* and *B* are rotating (we will assume) with the same peripheral velocity and both in a clockwise direction. The work piece *C* lies in the crotch and naturally rotates with the same peripheral velocity as the rollers. Once the velocity of all peripheries is identical, the two rollers and the work will remain in their respective positions, the work piece idly rotating. If, however, the roller *B* is speeded up slightly; the increased speed will tend to make *C* move round the roller *A* in a counter-clockwise direction. It will not do so, however, since immediately it leaves the surface of *B* its speed is reduced to that of *A* and it drops back into position to repeat the cycle indefinitely. If, on the other hand, the speed of *A* is slightly increased, the piece *C* tends to rotate round the circumference of *B* in a counter-clockwise direction. This time, the effort causes it to wedge itself more and more tightly between the two rollers, rotating at the same time. Its diameter is gradually reduced until it equals the difference of the combined radii of the two rollers, and the distance between their centers. By varying the speeds of the two spindles the work can be made to feed automatically through the rollers at any desired applicable speed.

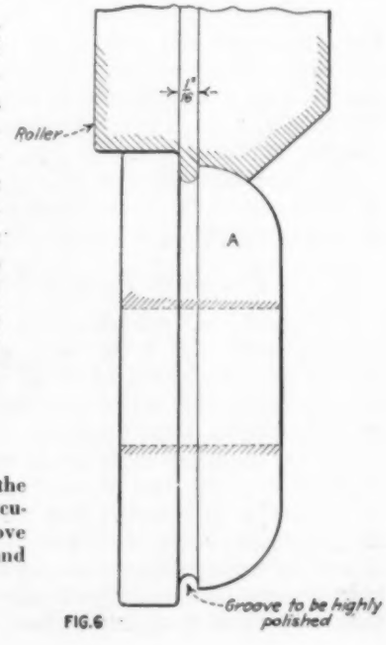

Fig. 6—A roller replaces the lapping stick on this circular beading tool. The groove is accurate, uniform and highly burnished

Employs a Feeder Blade

This machine needs a highly skilled man to set the wheel speeds and is therefore considered expensive in some districts. It has been superseded by a somewhat similar machine employing a feeder blade having a definite predetermined number of vertical movements per minute. The wheel layout is shown in Fig. 8. *A* and *B* are the rollers. The spindle *H* of *A* is the driver. The roller *B* and its spindle *H* are free to rotate. *F, G* and *K* are clamping plates and nuts used to hold the rollers in the same manner as grinding wheels are held. *C* is the work piece which has been fed from the hopper to the wheel-feeding station whence the feeder blade *D* pushes it through the guides *E* into contact with the rollers. The wheel *A* is motor- driven and bites into the work, causing it to rotate. Jamming the wheel *B* causes that to rotate also. The speed of this latter wheel adjusts itself automatically to the rate the work is traversed between the two wheels.

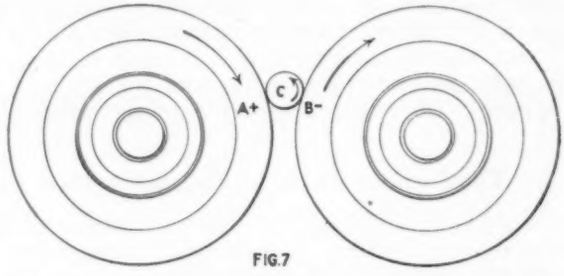

Fig. 7—The forerunner of the centerless grinder. Difference in the linear speed of the two rollers fixes the time taken to finish the part

Figs. 9 and 10 show a type of pin and stud made on the hopper feed machine shown in Fig. 16. No. 9 is formed at the rate of 70 per min., and No. 10 at the rate of 80 per min. In small parts like these, the superiority of the process, in certain particulars, shows itself.

Figs. 9 and 10 are representative of one class of work done by the hopper fed machine shown in Fig. 16. The wire used for them is $\frac{1}{4}$-in. and 3/16-in. pickled black wire in coils. This wire is cut off in a rivet machine and fed to the hopper. It matters not whether the cut off pieces are straight, or exactly to length, the rolling operation takes care of that. The finished parts are polished and accurate to size.

One of the rollers in Fig. 9 has a flat face; the face of the other is shaped to form the part. The ends of the part must be rounded and no projection or tit left on the end. This latter is taken care of by extending the outer flanges of roller *B* over the center line of the part. In

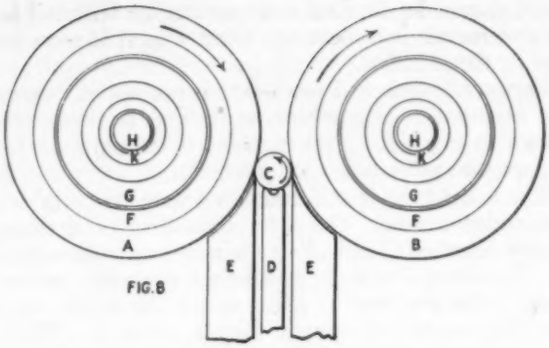

FIG.8

Fig. 8—Duplex rolls with one driving and one driven roll. The work is fed into the path of the rollers by means of a feeder blade which moves up and down at a predetermined rate per minute

this way both ends of the work are polished and free from burr.

In Fig. 10 we have a slightly different condition in that both the shoulder, and overall length must be held much closer than would be thought possible in machining. Where no roller was available the job would be a centerless grinder job, requiring three operations at least. The overall length is controlled by the outer flanges of *B*, and both ends of the pin are polished. Any surplus material is removed by attrition during the operation.

The piece shown in Fig. 11 presents no difficulties, and since a slight projection on the ends is of no consequence here, the two rollers are identical and allow any excess metal to flow beyond the 5/16-in. diameters at each end.

With the piece shown in Fig. 12 any projection is undesirable on the spherical end and the right hand roller encircles and overlaps one-half of the ball. Excess metal is forced upwards and is cut off in subsequent operations.

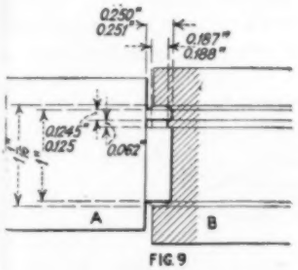

FIG.9

Fig. 9—Rolling chain studs at 80 per min. Shoulders and overall length are accurate and not subject to variation because of tool wear

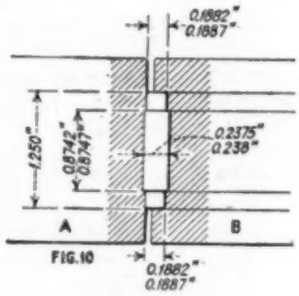

FIG.10

Fig. 10—Another steel stud rolled at the rate of 70 per min. from coiled, black wire, cut off in a rivet making machine and fed automatically from a hopper. Note how the form of the roller *B* makes a spherical end without tit or burr

One of the most difficult jobs on the screw machine is the production of perfect spheres. Fig. 13 shows the simplicity of rolling these troublesome items. To produce these by the turning method required material to the extent of 28 lb. per 1,000 pieces, the rolling machine reduced this figure to 19 lb. and increased the output by over 250 per cent.

There are other jobs that are almost impossible to produce by any other method with economy, such as small hollow articles. Figs. 14 and 15 show two of these; it would tax most production engineers' minds to devise a method other than rolling where a guarantee of 100 per cent good work could be promised. Thus the rolling machine even invades the realm of press work. The fact is, of course, that rolling supplements each type of machine tool and does not in any way take its place. Each has its particular field.

All the work that has been described was rolled cold. The method is equally applicable to hot work on large parts and is so used on the continent and in the United States. Gear blanks, car wheels and turbine diaphragms, are examples of articles commonly made by hot rolling.

There are two general classes of small rolling machines,

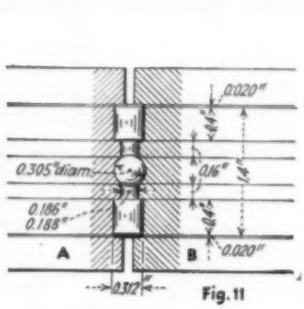

Fig. 11

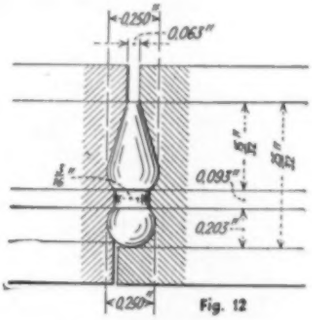

Fig. 12

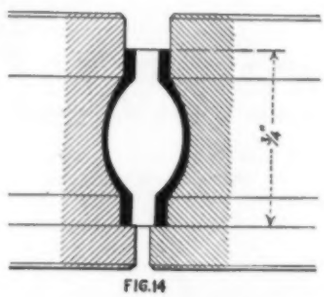

FIG.14

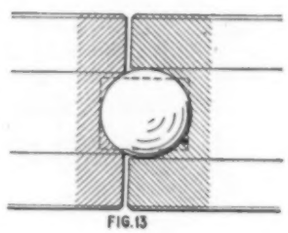
FIG.13

Fig. 11—In some cases the roll faces are different; here, they are made alike to relieve any forming strains. Any surplus metal goes into the length which is not important

Fig. 12—Duplex rollers forming a soft brass ornamental piece at the rate of 70 per min. Probably no other method can excel on similar work, either in speed, finish, or lack of scrap

Fig. 13—Cubes converted into spheres without scrap. Rolling flows the metal without trouble

Fig. 14—It is difficult to produce a hollow olive-shaped tube with 100 per cent good work by any other process than rolling

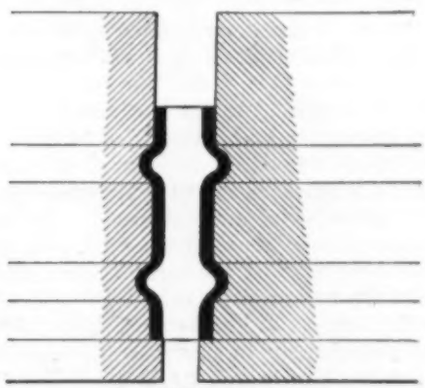
FIG.15

Fig. 15—This corrugated tube was originally made from solid rod. The rolling machine produces a lighter, cleaner job from tubing

one having a single roll and the other two rolls. Perhaps the most common of rolling machines is the single spindle type shown in Fig. 1, wherein the cast frame *Q* supports the flywheel shaft *K* with flywheel *L* attached. The opposite end of the shaft carries the pinion *J* meshing with the gear wheel *H* which is in turn keyed to the roller spindle *E*. This spindle is housed in two removable bearings. The bearings butt against the two brass bushings *D* and the whole is locked into position by means of the lock nuts *F* on the end of the shaft. Between the bearings is carried the roller sleeve assembly *B* solidly keyed to the shaft. This assembly consists of the sleeve *C* with the nut *D*. The roller or rollers are clamped rigidly between the two faces. The work is carried on the arbor *O* and clamped between the two sleeves *M*, which act

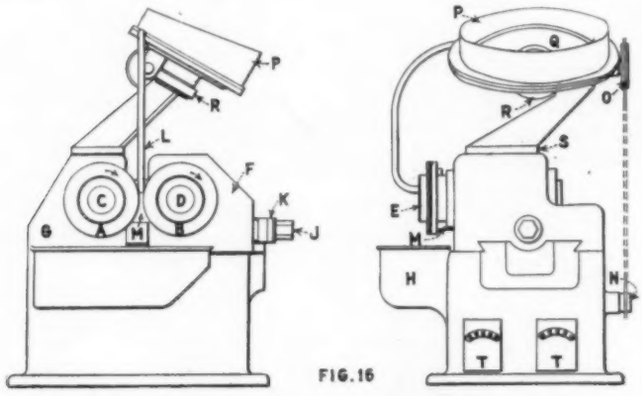

FIG. 16

Fig. 16—Duplex differential-feed automatic cold-rolling machine fitted with variable-speed motor drive

also as bearing journals on which the complete arbor rotates. The ram *P* is carried on two massive slides machined into the casting *Q* and pressure is applied either through hydraulic or screw gear by the blocks *S* acting as bearings to the thrust pin *R*. The sketch shows a screw gear machine, the screw being shown at *T*. Motion is given by means of the large handwheel *U* or by means of an electric motor *X*. The latter runs continuously, there being two clutches controlled by the lever *V*. Two stops are arranged on a telltale screw *W*. These trip the clutch as soon as the screw *T* has made a predetermined number of revolutions, thus controlling the size of the work.

Operation Simplicity Itself

The operation is simplicity itself once the machine has been set up. The blank is inserted between the two sleeves *M*, the arbor *C* is pushed through, nuts tightened and the whole dropped into the half bearings of the ram *P*. A copious supply of oil is projected onto the roller face from the oil well *Y*. The lever *V* is switched over to "IN" and the machine left to itself while the operator releases the arbor he has just taken out. By the time he has assembled a new blank on the arbor, the one in the machine has been finished, the lever *V* is switched over to "OUT" and the cycle repeated.

By careful setting of the stops *Z*, work can be produced that is consistent in size to really close limits. It is not unusual to keep within 0.002 in.

Such a machine can only be utilized where work is of medium or heavy dimensions, since the bending strains on the arbor are quite appreciable. Work that is not bored cannot be done on such a machine unless it is possible to mount it in bearings exactly as if it were assembled on the mandrel.

For small work and work that is not bored, two rollers are essential. A machine operating on such lines is shown in Fig. 16. This machine is known as a Duplex Differential automatic feed machine.

The usual type is self-contained with separate drive to each roller spindle. The two rollers *A* and *B* are mounted on the spindles *C* and *D* in their respective heads *G* and *F*. The head *G* is fixed and forms one with the machine base, while the head *F* slides along the heavy vee-ways propelled by the massive adjusting screw *J*. This has a micrometer nut flange *K* to enable fine settings to be made. Once adjusted, the head is locked in position.

The rollers *A* and *B* rotate in the same direction and are propelled by variable-speed motors controlled from the front of the machine. The speeds are accurately registered on meters attached to each spindle in full view of the operator. Work is fed to the wheels from the hopper *P* which is driven by the chain sprocket *N* and *O* through worm gear *R* which rotates the plate *Q*. This latter picks up the blanks and feeds them down the chute *L* whence they drop from the end against the plate *M* between the two rollers. The advantage of this machine is that it needs no mechanical feed to the work to force this through the rollers. This movement is automatic as shown by Fig. 7.

A Machine with Two Eccentric Rollers

The foregoing machines have all utilized the periphery of the rollers. This necessitated a short controlling arc that lengthened only with the diameter of both work piece and rollers. To increase the contact arc a machine was devised that utilized two eccentric rollers as shown in Fig. 17. The central roller is smaller than those on the preceding machines, but the outer roller is a ring that has its working circumference on the inside.

The work is fed down a chute from the hopper and passes under the outer ring to come up where shown in

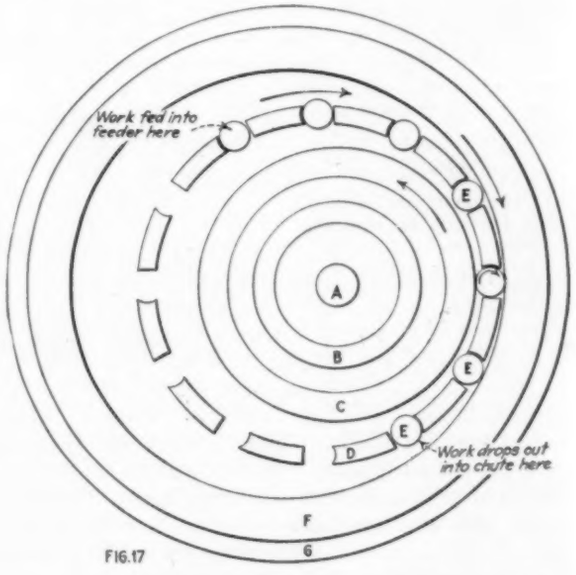

FIG. 17

Fig. 17—Duplex rolling machine using epicyclic rolls. The work is fed by hoppers through a chute into the driving plate *D*, which in rotating drives it through the rollers *C* and *F*. *C* is power driven while *F* rotates through friction of the work

the illustration. A circular feed plate *D* rotates at a predetermined speed and picks up work *E* as it passes the feeding tube. The spindle *A* rotates in a counterclockwise direction while the feeder rotates in a clockwise direction as does also the outer rings *G* and *F*. The spindle *A* is power driven, while the ring *F* is rotated through the frictional effects of the work. As the ring *D* continues to rotate, the work falls into a suitable receptacle as shown. This type of machine is only applicable to straight cylindrical work such as rollers for bearings, either parallel or taper.

The final questions in any process are those of economic manufacturing quantities and the cost of tooling relative to other processes used for the same work.

The cost of rollers differs because of different profiles and finish necessary. We have made rollers costing only 15 shillings each, while others have cost over 120 shillings (20 shillings at par = $4.86).

On small quantities of non-repetitive articles, the use of the rolling machine is out of the question. Other quantities and articles are a matter of comparison with other labor, material and tool costs.

Hardening by Grinding

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IN MAKING press tools it is often found that their shape causes difficulty in hardening them without distortion, and it is impossible to correct the distortion by either stoning or grinding. This is particularly true where accurate sizes in the product must be maintained. Therefore, it has been the custom to use soft punches, slightly enlarge them by hammering the faces and shear them into the dies so that they will cut clean. This method answers quite well for working soft stock such as brass and aluminum, but for steel, it is unsatisfactory.

Having noticed that when a carborundum wheel of hard grade becomes filled, its use will cause a superficial hardening of the surface of some grades of steel, especially those of the oil-hardening variety, I have used such a wheel for grinding a slender punch of complicated form. In this case, the tools were combination ones for piercing and blanking hard brass. The die was made in sections that were individually hardened and then ground to fit. The conditions respecting the punch were such that attempts to make it sectional had not been altogether successful, therefore it was left soft.

A small piercing punch that was hardened, and that perforated one end of the blank, continually made trouble by springing and shearing the hole in the soft blanking punch, thus causing a burr around the pierced hole in the blank long before it became necessary to sharpen the soft blanking punch. The blanking punch in this case was also used as a die, and the metal around the hole was so thin that a bushing could not be used.

When it became necessary to make a new blanking punch, it was made a good fit in the die and then ground on the face to nearly the desired length, using a soft wheel. The remainder of the metal was ground off with a hard, filled wheel. Before starting, some beeswax was dissolved in lard oil and applied to the wheel. The mixture, being about the consistency of a thick paste, did not fly off of the wheel, but some of it was carried to the work, which was held on a magnetic chuck. While the wheel loaded with the mixture could not take a heavy cut, it developed much friction and heated the end of the punch to a dark blue for about $\frac{1}{16}$ in. of its length. For this purpose, a Grade J wheel has been found best after considerable experimentation. Too hard a wheel will create an uneven surface, but a wheel of this grade will grind flat and at the same time produce the desired hardness.

The punch was made of oil-hardening steel, and apparently, the heat of friction applied at the small point of contact caused the lard oil to harden the steel for a considerable depth. In fact, a file would make no impression on it, although the punch was a dark blue along the sides. It was believed that the magnetized condition of the punch had something to do with the hardening, since another piece of the same steel, held on the table of the machine, was ground without showing comparable results. The slight burrs caused by grinding were removed and the punch was tried in the die, in which it fitted as well as before being ground.

The tools were then put into production and more than 100,000 blanks were produced without requiring attention, whereas the soft punch would not stand up for more than 10,000 blanks. This punch was reground several times, using a soft wheel, before the hard part showed signs of giving way. After the hard part had been ground away, the punch was again subjected to treatment with the hard wheel filled with the mixture of beeswax and lard oil. This treatment restored it to its former condition. At length, however, it became necessary to make a new punch and a new die. This time both members were made of oil-hardening steel and both were left soft except for the hardness given them by grinding with the filled wheel.

Great care was used in shearing in the punch, since the hardness of the die was chiefly around the cutting edges and of less depth than that of the punch. It was believed that the difference in the depth of hardening in the two members was caused by the greater amount of metal in the die, which did not respond to the heat of friction so readily as did the thinner metal of the punch. The life of this die was somewhat shorter than the ones that were quenched after being heated in the furnace, but it cost less to make, since no stoning was necessary. Besides, there was no risk of breaking or of cracks developing.

The conclusion reached was that wherever it was necessary to use a punch not hardened by heating and quenching, this method of hardening by grinding added greatly to its life; but for dies that could be made in sections, it was better to harden the sections completely through by the usual method, and to grind them to fit. Hardening by grinding has been successfully used for small solid dies where breakage or distortion was feared if they were heated and quenched. It has also been used for jigs and other small work where hard-wearing surfaces were desired at a low cost, and where the usual method of heating and quenching would introduce complications. In every application where it has been used, it has been successful.

The FOREMAN'S ROUND TABLE

How Much Economics?

"SAY, AL, what degree are you studying for in this man's college?" questioned Ed, as the two friends met at the gate on their way home.

"What d'you mean, nut?"

"Why, I heard that Williams was going to convert the factory into a college until times pick up. I always did want to finish my course and get a degree."

"What occasions the outbreak. I haven't seen any notice for a long time, have you?"

"No, but I have been receiving pamphlets and books on almost every subject under the sun that I am not interested in. I am wondering whether Williams is going to hold examinations and award degrees?"

"Don't worry, Ed. Williams probably knows that he couldn't force knowledge into that bean of yours, but he don't want to slight you by sending literature to others and not to you. The ignorant are very sensitive, you know."

"Yeah? Well, if I didn't know my business I wouldn't be working for Williams all these years."

"I was only fooling, Ed. You do know your business, but it wouldn't do any harm for all of us to know more about economics."

"I may not know much about economics, but I do know lots of facts, and they are more valuable."

"Sure they are, if they are facts. Economics merely traces the source of facts, strings them together and points out what they lead to. You and I have a few facts and our experience tells us how to use them in specific cases. Economics weighs all the facts, and shows us how to apply them to any case."

"Yes. Hatty Foster took domestic economy at college, and even her own family won't eat her applications."

"That is not the fault of the course, it's the fault of its application. Give her time. You and I have to experiment on any new job."

"Well, I know all the economics my business demands, and goodness knows we're having economy preached at us enough right now."

"Yeah, about all you know is the relation of labor, material and—no you don't even know what overhead is. Maybe I don't either."

"Sure I know what overhead is. It is something a shop man can spend, but not save, and an office man save but not spend—something that shop men and office men do not agree with each other about, nor among themselves."

"Almost as much of a riddle as overhead itself, Ed. I guess maybe you do know something about it. Suppose you untangle that statement."

"Well, for instance, I wanted some special tools made, and the cost department showed me where the added overhead would make the tools cost more than they could save. Not long afterward I changed over another job so's I wouldn't need any new tools at all, and the only darn thing the cost department would give me credit for was the actual time saved—no tool costs, no overhead."

"That illustrates what Williams has in mind. If you had understood the law of manufacturing cost, not the application necessarily, you could have told the cost clerk where to get off, instead of his telling you. The few laws of manufacturing management can be printed in a ten page pamphlet."

"Say, Al, if management can be learned by reading a couple of hand bills, tell me why they pay the 'old man' and Williams such fat salaries? Suppose I learned the laws of management by heart, would I be a good manager?"

"Not by a darn sight. A law is something that happens a majority of times. The old man, and Williams get paid for being able to make 'em happen oftener."

How much economics should a foreman know? What action, if any, should management take in this direction?

Discussion of Former Topics

"Till It Hurts"

Strange as it seems, even men who feel unemployment relief funds are necessary hate to contribute. They will do almost anything for a needy friend or relative, but an unemployment fund isn't near enough to their hearts. To the former a man gives voluntarily; to the latter he is forced to give, which means that if it were left to the men to give voluntarily, no great success would be achieved.

It is my opinion that the department head is the logical person to make these collections. From personal contact with the men, he knows about them and what they can afford to give. Knowing this, the worker will not refuse to give unless he has a good and sufficient reason. Most men will grumble in a good-natured way when called upon to contribute, but will, after explanation, furnish the amount they think is right and which, in general, is satisfactory. Persuasion, not pressure, should be the only selling argument used. It is not fair to condemn the non-contributor unless all the facts are known. Often such a man cheerfully bears a burden that is heavier than that of some of the recipients of charity.

An employer, having first satisfied himself that the funds are properly handled, should proceed to sell the scheme to his employees. If adequate contributions are not forthcoming, a definite percentage of earnings should be fixed as a minimum, and insisted upon. An unwritten law handles the situation, and offends none. While drastic, a successful welfare campaign is doomed without some such method.

—H. L. Lackman.

Muzzling the Press

The right of free speech is a wonderful thing, yet it must have its limitations just the same as all other rights and liberties of a free people. An unbelievably large part of the misery in the world is caused through careless, illogical comment or thoughtless talk. Many a chance remark, often made in jest with no thought of seriousness, has had a long lasting bad effect.

No man should try to force his opinions on others. Usually they are mere prejudices and not founded on fact or logic. But however good they may be basically, they will only cause ill feeling and friction and have a bad effect when continually thrust upon other people. In a short time, a wrong impression of the man is created in the minds of his fellow-workers and superiors, and at times, a man's status is lowered in the eyes of his superiors by a distorted version of some random remark.

–L. O. Brown.

Carelessness

A man who has repeated accidents is not a good workman or a good executive. Despite all the arguments, which may be advanced about extenuating circumstances and the origin of the accident, there is still in it the primary element of carelessness. There is basically no difference between an error of judgment and carelessness. In the last analysis, no matter what deep and logical theories are advanced to the contrary, there is only one effective way to cut down accidents, and that is to make the penalty sufficiently severe to demand attention for accident prevention. At the risk of being considered arbitrary, I would say that there should be no exceptions to enforcing the penalty. This may occasionally work a slight injustice, but it is far better to do this than to list penalties, and then grant waivers on the least pretext. —Harry Shaw,

Rules is Rules

Preparation of factory rules calls for close consideration of all conditions and for careful wording to prevent doubt as to the exact meaning of the rule. Rules should be observed exactly and literally. If the rule has been drafted rightly, all unusual cases are safely covered.

When a rule is made, there are always possibilities which have been missed. If a case occurs where the rule seems foolish, that is exactly the time when literal obedience is essential. Follow the rule and the manager can trace the issue. If everyone in the shop acts as he thinks fit, when he thinks the rule foolish, it is impossible to trace and correct the errors.

—M. P. Dalton, *Kent, England.*

Service or Ability

In the matter of employing a man, more than ability to fill the job has to be taken into consideration. Personality and salesmanship are the stepping stones to better positions. I agree with Al that there are many men in the employ of different companies who are capable of handling better positions, but if it takes from 10 to 20 years for him to convince the executive that he is qualified, he isn't progressive enough and doesn't have salesmanship enough to put across his point.

On the contrary, if a stranger applies for the position, and in a few minutes of conversation is able to make an impression, which Ed claims one of his new men has made on him, this chap surely has a winning personality and is salesman enough to warrant an opportunity to prove his ability. —Samuel J. Boyle, Jr.

Run-of-Mine

Statistics show that the percentage of illiterates is decreasing, and we are quite safe in assuming that a more intelligent class of workpeople is being absorbed into industry each year. With this fact in mind, I firmly believe that the operator in the average machine shop, where production schedules call for manual dexterity rather than mental effort, is quite on a par, if not superior, to his brother of the same grade in other industries. I have also noticed that the machine operator type is gener-

ally recruited from the ranks of the city bred; the higher strung nervous temperament of the city man seems to take more kindly to the strain of the production line than the slower reflexes of the country man.

In disagreement with Ed's contention, I maintain that the average man is mechanically inclined, the strength of his inclination depending on the financial inducements offered. In the average machine shop, these inducements are not alluring when they are contrasted with conditions in the average mercantile occupation.

A glance at the roster of any technical day or evening school will give an interesting slant on this question. Out of every hundred students, only ten per cent display interest in the machine shop practice course, mechanical drawing and design being more popular because of the working conditions involved. The lowly ten per cent, however, are in every respect equal in intellectual attainments.

—Robert S. Alexander.

On the Spot

If the order issued by the general superintendent is necessary to prevent Ed and Al from making pleasure trips around the works, the foremen appear to be just what Williams has made them. They are surely realizing that the management is more desirous that notices be carried into effect, than that foremen take a real, live interest in the work entrusted them.

The right foreman can supply motive power which affects the quality and quantity of production, but he will do very little by posting notices, using pencils of various hues, or by being chained to the shop.

—D. Q. Dunstone,
Durham, England.

Treasure Chests

If a man can't go to his foreman with his ideas and get a square deal, he must be working for a man who knows little of modern foremanship. Most people expect a man, who has been elevated to the rank of a foreman, to have a broader view of his job and to operate as a manager of his department. No good manager ever overlooks the possibility of securing the assistance of the men who work for him. He should be always finding ways and means to encourage his workers to shoulder some responsibility and to make suggestions for better quality, cheaper costs and safer production. The good foreman knows that a man assumes a sense of proprietorship in his job if he can contribute something which makes that job better. The whole job of foremanship is to so develop the workmen that they, as individuals, will bend every physical and mental effort to "make a better product at a lower cost."

No element of criticism should enter into the suggestion scheme of getting ideas from workers. Because an employee thinks of a new and better way of doing an operation, it is no criticism of the ability of the foreman to foresee this improvement. All the progress in any shop is not finished the day the engineers turn over the blueprints of a new product, and the planning department releases the tools and instruction sheets to the shop. Progress is a progressive thing—improved methods and better ideas constantly being found and used. Therefore the foreman should be proud when his department stands high in the number of suggestions sent in, and he should devote some part of every day to discussing with his men better and cheaper ways of doing that operation.

A suggestion should not be hidden in a suggestion box but be given openly to the foreman who is proud to pass it on (maybe with some added improvement) to the suggestion committee. —E. H. Tingley, *Secretary, National Association of Foremen.*

Run-of-Mine

A few years ago, I was "heading up" a group of apprentices in a large machine shop. We aimed to have forty boys in training as toolmakers, heat treaters, and general machinists.

We never had a surplus of good material. Few of the boys would consider spending four years learning the forging and heat-treating business; yet with the growing use of alloy steels this branch is vitally important, and skilled men are always in demand at high wages.

Boys are no longer willing to learn a trade. They either want to be helpers at a higher starting rate than apprentices, or they serve a couple of years at a trade and then start "booming." Many are attracted to jobs in industries where speed on piecerate operations, which require little skill, brings them a fair income from the start.

In the Masonic Home group at Elizabethtown, Pa., is a first-class, endowed trade school where trades are taught to the sons of deceased masons. Even though everything is free, and the school is intended to help those that need it most, there is a great difficulty in securing enough boys to keep it going. The boys want white-collar jobs. That tendency is prevalent everywhere and is responsible for the dearth of really good well-trained mechanics. I'm afraid we'll have to do with what we can get. —James K. Matter,
Aluminum Cooking Utensil Co.

Carelessness

Rules alone won't do, unless the spirit of enforcement is there. The president's policy, the manager's methods, the foremen's actions, the job setter's attention to detail, all have their influence on the carefulness or the carelessness of the mechanic.

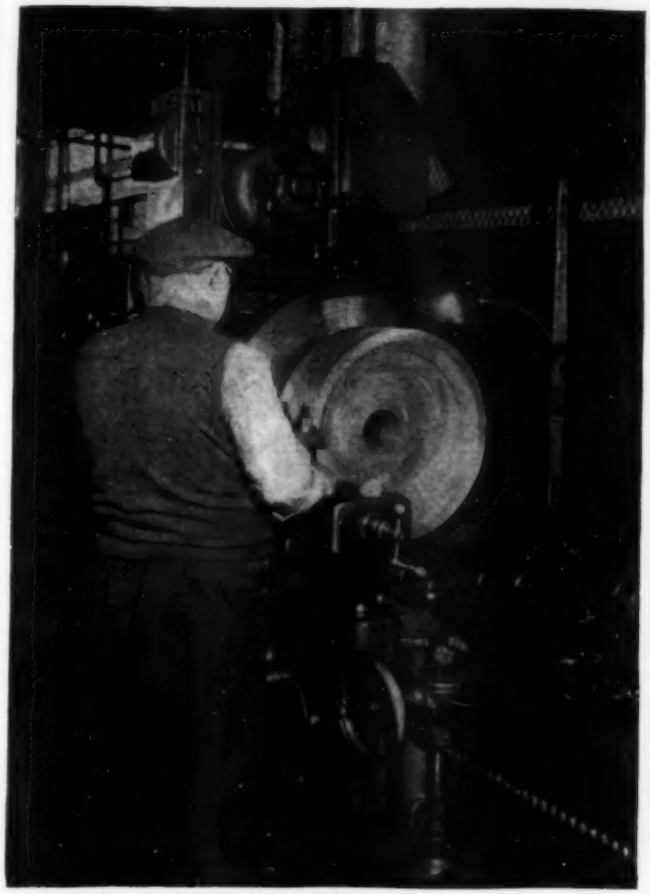
To the onlooker, Ford carries on with a policy which demands attention on the part of the workmen, thoughtful observation on the part of supervision, and provident caution on the part of executives.

A workman drops a four inch bit of triangular sheet steel on the floor. If the sweeper observes it, he comes immediately, and tells the workman where the scrap barrel is located. If the job leader observes the act, he says "Cut it out. I get hell for enough things without that stuff on the floor" and so on straight up the line.

The order for a piece of steel to replace a scrapped piece must be signed for by the man who scrapped the piece, and several memos of this kind on his employment record don't look so good when a partial layoff comes or when raises are in order. For the point of a drill to touch the drill press table is unpardonable, and a drill that drills oversize is no abili for a sloppy dowel hole.

The job boss gives the diemaker the wrong templet and the die contour is not ground right; both the job boss and the diemaker get a forced leave of absence to think the matter over. A foreman watches a sling used without the proper padding. Next we see him on the bench with a file in his hand. In fact, no one of the thousand common careless acts are lightly overlooked, yet not one single printed rule is seen.

—E. H. Fish.



Most grades of nickel-chromium cast iron can be machined without trouble

Nickel-Chromium Cast Iron Dies

HERBERT CHASE
Consulting Engineer

It has been found that the addition of nickel and chromium to cast iron gives an alloy that can be cast to shape for forming and forging dies. Analyses of the alloys used for various purposes are tabulated and discussed in this article

CAST IRON, alloyed with nickel and chromium, is employed with considerable advantage for stamping, pressing and in some cases for forging operations. It is used in working both ferrous and non-ferrous sheet.

Dies made from nickel-chromium cast iron cost less initially than hardened steel dies and in many cases are considerably longer lived because of the wear-resisting surface. They possess a fine grain, take a high polish and largely eliminate the galling of pressed parts.

One of the major economies realized by the use of such a metal for bending or forming dies is that they can be cast very close to shape. This effects economy in machine work, since much less metal has to be removed, as a rule, in comparison with steel dies. In the case of large dies, such as are used for automobile body and similar stampings, ordinary cast iron has long been employed, but in large quantity production the casting has to be recessed to receive hardened steel inserts on edges and corners. Such inserts require considerable machining and must be fastened against a machined seat. No such inserts are required with nickel-chromium cast dies.

Several foundries in the Detroit district are casting dies from nickel-chromium alloys, and some foundries in other localities are prepared to furnish them on order. The Ford Motor Company has found this type of cast die highly satisfactory.

A number of considerations have a bearing upon the particular mixture to be selected. Several formulas that have been used for different classes of work are given in an accompanying table. Some alloys are used without heat-treatment and, in that state, have proved durable. But greater hardness and improvement in other qualities are effected by heat-treatments.

When the degree of hardness required is such as to permit of economical machining after heat-treatment, this practice is recommended, but where considerable hand work is required or where the hardness needed is too great to permit of ready machining, the material is usually worked in the as-cast condition, or may even be annealed before machining. In some cases grinding is done after heat-treatment, as the quantity of metal to be removed by this means is usually small.

Generally speaking, the thinner the section of the die the greater is the hardness obtainable. Where very thick sections are needed for adequate strength along with higher hardness, two alternatives may be followed. More nickel-chromium may be added, or additional alloying metals such as vanadium or molybdenum may be added to the mix. An iron containing 2.50 per cent of nickel and 0.50 per cent of molybdenum alone or with chromium has high strength and hardness, even in heavy sections, and responds well to heat-treatment. The second alternative is to cast separate and relatively thin inserts which can be given adequate hardness without employing vanadium or molybdenum, and then to apply the inserts to a separately cast base. This expedient, however, is rarely required. In one instance, the superior wear resistance of cast alloy iron led to the use of such inserts on a forged steel base of a die employed for making very heavy stampings, thus reversing the practice often followed of using forged steel inserts in gray iron dies.

A large number of mixes have been developed to meet different hardness requirements. When considerable hand work is necessary in finishing a die, a hardness around 200 Brinell is found desirable, but if the major portion of the machine work can be done on machine tools, a hardness of 200 to 248 Brinell is often specified. In some cases hardness numbers as high as 270 Brinell have been obtained in dies as cast, and if the nickel content is increased to as much as five or six per cent, hardness numbers in the 300 Brinell range are obtained as cast.

Both the hardness and wear resistance of a cast die

Analyses of Nickel-Chrome Cast Iron Alloys

Designation	Base Analysis per cent			Total C, Per Cent	Alloying Elements, per cent							Heat-treatment Used or Recommended (F. temperatures)
	Steel Scrap	Pig Iron	Scrap or Returns		Ni	Cr	Si	Mn	Va	S max.	P max.	
A	30.0	30.0	40.0	3.20 3.30	2.50 3.00	0.70 0.80	1.25 1.75	0.60 0.80	.....	0.12	0.25	Low Si used in heavy sections.
B	40.0	.....	.....	3.10	2.50	0.75	1.25	0.60	0.20	0.12	0.20	.....
C	40.0	Mayari 10.0	Low P Pig 50.0	3.20	2.00 3.50	2.00 0.75	2.00	0.70	.....	0.15	0.18	.....
D	50.0 60.0	.....	.....	3.10 3.30	2.50 3.00	0.75 1.00	1.00 1.20	0.60 0.80	.....	0.12	0.25	Heat to 1500-1600. Quench in oil. Temper 500-700 to hardness desired.
E	.....	.....	.....	3.00 3.25	1.75 2.00	0.50 0.75	1.00 1.50	.....	.....	.....	.....	Heat at 1500 one hr. for each in. in thickness. Quench in oil. Reheat at 500 to 900 until B.H.N. is 300 to 320.
F	.....	.....	.....	2.75 3.25	2.00 3.50	0.50 1.00	0.60 1.50	.....	.....	.....	.....	If heat-treated, use treatment similar to E.
G	.....	.....	.....	2.80 3.00	1.50 2.00	0.25 0.50	1.25 1.50	.....	.....	.....	.....	If heat-treated, use treatment similar to E.
H	.....	.....	.....	3.00 3.30	5.50 6.00	0.50 0.60	1.70 1.80	.....	.....	.....	.....	This mixture used to secure 300 B.H.N. or over in as-cast cond'n
I	.....	.....	.....	3.00 3.30	1.50 2.50	0.50 0.75	1.50 1.70	.....	.....	.....	.....	Heat at 1575-1600 one hr. for each in. thickness. Quench in oil. Reheat at 500-900 until B.H.N. of 300-320 is secured.
J	.....	.....	.....	2.75	2.00	1.00	0.75	.....	.....	.....	.....	Heat at 1450 one hr. for ea. in. thickness. Quench in water. Reheat in boiling water to relieve stresses. Or quench in oil and reheat in boiling water.
K	.....	.....	.....	3.00 3.30	1.50 2.00	0.50 0.75	0.90 1.00	.....	.....	.....	.....	.....
L	.....	.....	.....	3.20 3.40	0.75 1.50	0.50 0.60	2.00 2.20					Heat at 1575-1625 one hr. for each in. thickness. Quench in oil. Reheat to 600-800. Cool in air.
M	.....	.....	.....	3.20 3.40	2.00 2.50	0.75 0.90	1.25 1.50					
N	.....	.....	.....	2.75	2.00	1.00	0.75	.....	.....	.....	.....	Same as J.

can be increased materially by heat-treatment. As high a Brinell number as 400 is secured by quenching in oil and using a low drawing temperature of about 400 deg. F. Most of the alloys here mentioned are quite free from warpage when quenched in oil. Cracks may result, however, if water quenching is employed.

To meet conditions in which die material of relatively high tensile strength is needed, the carbon content of the mixture to be cast is reduced. It is then possible to secure tensile strengths of 50,000 lb. per sq.in., and still maintain adequate hardness for most purposes.

In the automotive industry several compositions of die material are employed to meet various conditions, such as gage of sheet used, depth of draw, sharp and round corners, life required, and other factors. Several of these analyses are given in the accompanying table.

One of the largest producers of castings for automotive dies has about standardized on analysis *A*, which gives excellent wear resistance and good machineability, but this analysis is varied on occasion to meet special conditions. By varying the chromium content between 0.50 and 2.00 per cent, this analysis can be used for any size of die, the variation depending upon the section. For sections up to two inches thick, a chromium content of about 0.50 to 1.00 per cent is about right. As the thickness of section is increased to six or eight inches, the chromium content is increased up to two per cent. If the chromium content exceeds 1.00 per cent, it is necessary to leave the casting in the sand until entirely cooled to prevent a hard surface that greatly impairs machineability. The base used in analysis *A* has the advantage of being suitable for a large variety of so-called "semi-steel" castings and consequently overcomes the objection of running a special charge for a small quantity of dies.

Dies of analysis *A* have been used extensively by other large body manufacturers. Every foundry in Detroit handling work of this character is reported to be using, with slight variations, either this analysis or analysis *B* which contains a small percentage of vanadium. The latter is strong and highly wear-resistant but involves some sacrifice in machineability.

Another large foundry in Detroit has developed a die iron of analysis *C* for dies used in heavy production work. Several makers of automobile wheels are among the users of dies having this analysis, and body dies are made

from the same analysis, except that the nickel content is raised to 3.50 per cent and the chromium decreased to 0.75 per cent.

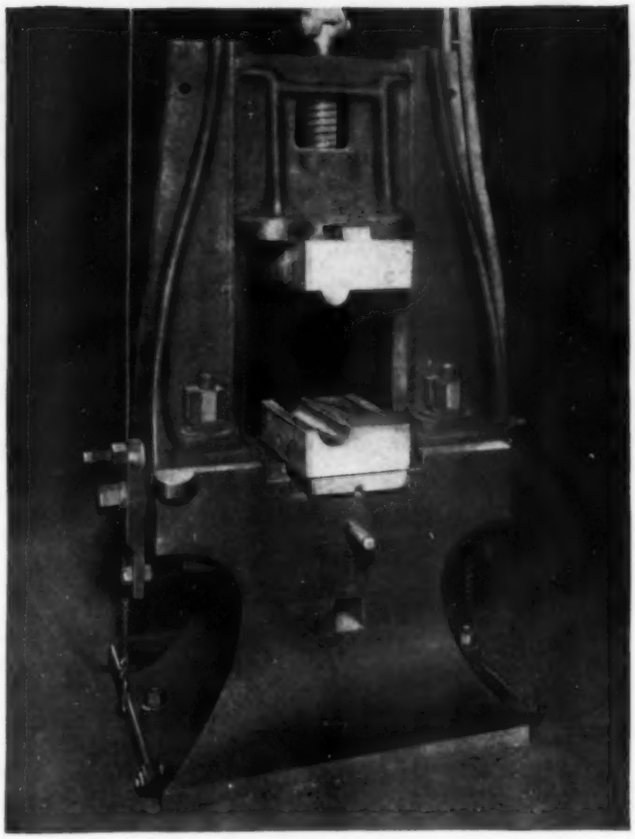
Ford Motor Company and at least one other manufacturer of radiators use dies of analysis *D* in place of dies lined with tool steel for forming radiator shells. In the heat-treated form, these dies are reported to wear three times as long as when not heat-treated.

Dies containing 3.52 per cent nickel and 0.50 per cent chromium, cast for the Budd Wheel Company, are reported to have produced as many as 40,000 stampings from $\frac{5}{8}$-in. stock without redressing. Similar dies are employed for drawing brake drums from $\frac{5}{16}$-in. steel sheet.

Other dies for automotive work have been made from analyses *E*, *F*, *G* and *H*. Of these, analysis *E* is employed for drawing thin sheets in which the draft is light and the curves are full, such as light car fenders and body parts. This grade is easy to machine and is well suited to dies on which considerable hand work is required. Dies of analysis *F* are better for medium duty and deeper draws, the chromium and silicon content being varied with the section thickness. For very thick sections the silicon content is lowered and the chromium content increased. As many as 50,000 chassis channel blanks have been drawn with a die of this analysis.

Although best suited for heavy-duty work, dies of analysis *G* have been used for nearly all types of work, but they are harder to machine than some other compositions. As many as 126,000 fender and body parts have been drawn with dies of this grade with only three hours required for redressing. Iron of this analysis has a tensile strength in excess of 50,000 lb. per sq.in. For especially heavy work dies of analysis *H* is recommended. Also where sharp corners are required. In one case where dies of this composition were used for drawing steel brake drums they were reported in good condition after 8,300 drums had been drawn.

All nickel chromium iron dies are made more durable by the proper heat treatment, but in some cases such treatment is not required unless the quantity of stampings made is large. Some of the heat-treatments used are given in the table. In case castings come from the mold in a hard condition, and are difficult to machine, they can be annealed by heating to 1,400 to 1,550 deg. F. and holding at this temperature one hour for each inch of section, and then allowed to cool in the furnace. Such annealing reduces the hardness from forty to fifty points on the Brinell hardness scale, as compared to that in the as-cast condition. A final heat-treatment is then depended upon to provide the hardness desired to minimize wear, the final finishing being performed on the heat-treated material.

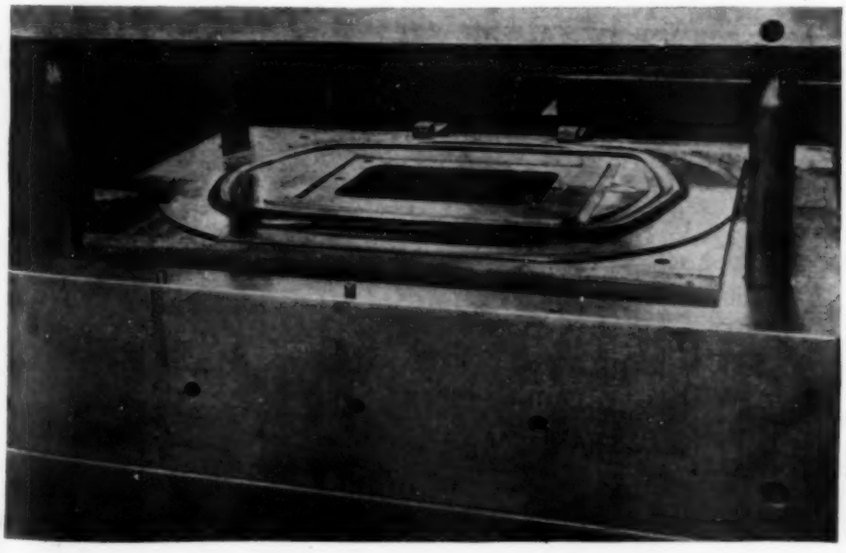


This material will stand the shock of drop-forging

Foundries in many localities cast dies for a variety of non-automotive purposes, such as kitchen utensils, sinks, trays, parts for agricultural machinery and other industrial products. Dies for these parts are usually made from iron of analysis I. Such dies, even without heat-treatment, last between redressings from three to four times as long as ordinary steel dies, and their life can be further increased by heat-treatment.

For pressing boiler plates, dies measuring as much as 8x10 feet and 42 in. high have been employed in hydraulic presses. Breakage, previously experienced with dies used for this work, is said to have been eliminated. Metal of analysis *K* is employed.

Dies for hot pressing and drop forging are also made from nickel-chromium cast iron and are well adapted to resist the action of heat and shock involved. Reports indicate that they compare favorably with steel dies for



Sharp corners are characteristic of this radiator front die

forming various agricultural implement parts, such as plow points cultivator teeth, shovel blades and shanks. In the case of dies needed for making drop-forgings in comparatively small quantities the dies have even been sunk by the simple expedient of pressing the two halves of a die together against a sample piece, after heating the blocks to a temperature of 1800 deg. F. Of course the sample piece must be of simple design and made to such dimensions as to allow metal for finishing where machining is required. In some cases forgings for repair parts have been made by this method, using an old forging as the sample, and perhaps doing some little work on the die after sinking the impression. This operation is similar to the "hobbing" operation used in drop forge die work.

Compositions having analyses such as *L* or *M* are employed for hot-pressing and forging dies. Analysis *L* has been used where only iron of the silicon content named has been available. Analysis *M* gives decidedly better results, but requires an iron of considerably lower silicon content.

Another purpose for which nickel-chromium iron is used is in dies for striking and forming malleable castings. Such dies compare favorably with steel dies both in life and in first cost. They are made from iron of analysis *N*. Such dies require hardening after the impression has been finished.

Other instances could be cited in which dies cast from nickel-chromium alloys have demonstrated their advantages, but enough has been said to indicate their possibilities. They are believed to possess advantages for other applications yet to be tried, but it is not expected, of course, that they will displace steel dies in all cases. Where a marked saving in machine work appears to be possible, and resistance to abrasive action are important factors, cast alloy dies will merit investigation.

Machining Allowances on Forgings

Discussion

Holding a forging exactly to the dimensions given on the drawing does not always result in true economy

FRANCES W. SHAW
Consulting Engineer, Lancashire, England

WHAT to allow on forgings for machining is a larger problem than some of those who control such matters realize. James R. Cornelius, for instance (*AM*—Vol. 75, page 490) stigmatises as wasteful an allowance all around a nickel-chrome steel forging of ¾ in. plus the depth of the finishing cut, where the finished diameter is about 10½ in. So large an allowance, he asserts, implies bad management. May I suggest that the superintendent's apparent obliviousness of so obvious a waste implies, rather, management in perfection?

It should be understood that when we speak of allowance, the word is intended to refer to the maximum distance from the black surface to the finished surface, and this distance may vary from the maximum to some suitable minimum.

Though our title speaks of machining allowances, the material surplus to the finished piece, or most of it, is not there simply to be machined away, but because of forging difficulties. All the machinist needs is sufficient surplus to insure the removal of surface defects, to ease the work of centering and to allow for slight errors in these. Generally, on forgings up to a ton or so in weight, an allowance of ¼ in. would suffice if—a very big "if"—the forging could be made nearly as accurate as the finished piece.

A few of the writer's experiences may serve not only to illustrate the folly of dogmatising, but indicate to some extent the allowances that ought to be made in similar circumstances.

To readers who have witnessed the production of heavy forgings under steam or pneumatic hammers, and who have noted the comparative crudeness of the tools and the difficulty with which the work is manipulated and presented to the tools, it must be a source of wonder how men can get forgings as accurate as the worst they have seen, not the best.

On the other hand, those who have had the handling of drop-forgings or stampings, whose form is predetermined by shaped dies, will find it an equal source for wonder why so many of these drop-forgings have so much material to remove, or why they are so untrue that it constitutes a work of art to center or chuck them accurately enough to clean them up.

Until I knew the reason for such apparent madness, I was astounded to find that certain large forgings made to drawings in which the finished dimensions were given in addition to forging dimensions bearing a standard allowance of ¼ in. were always furnished rough-machined to within about ⅛ in. of the finished dimensions. The purchasing agent was directed to inquire into the reason and to suggest that if the forgers could afford to give away machining work, they could supply the black forgings at a lower price. To our letter the forgers replied that, if they supplied black forgings to our allow-

ances, the price would be higher. If, however, we were prepared to accept the black forgings as they made them for their own convenience, a small reduction in price could be made, provided that we would pay the freight charges on rejects and replacements, which with their present practice were intercepted in their machining department. Machining was, in effect, a process of inspection. It served, in addition, to save many hours of expensive forging. Moreover, with the heavy, rough and comparatively simple and inexpensive machines at their disposal, with low establishment charges, they suggested that in our highly-organized works it would be impossible for us to do the rough machining so cheaply. Is it strange that we decided to maintain the existing method?

Large worm shafts were forged 50 or so at a time. These were about 5 in. in diameter over the worm, the shafts about 3 in. in diameter. At each side of the worm was a flange as large as the worm. The forgers' practice was to start with the full-length bar, cutting the forgings off under the hammer with a hot-set. Forging was done by flat swages, one on the anvil, the other on the ram. The spaces between the worm and the flanges were forged between two fullers, one in the anvil, the other held in the hand. The bar was rotated intermittently between the blows so that the finished forging was polygonal.

Complaints came from the works that the machining allowance was so excessive that two roughing cuts had to be taken. Could they have closer forgings? The boss blacksmith, aware that the worms were turned in Lo-Swing lathes with 9 tools cutting simultaneously, and that each cut consumed but a few minutes, merely demanded whether it would pay to employ his gang of four men and his hammer with its equipment an additional half-hour. If so, he could give the shop a better job. That ended it!

Those who purchase forgings by weight will probably continue to specify the maximum allowance, even if they don't get it, for the reason that doing so leaves them free to expostulate whenever they consider the allowance excessive. Those who buy "per forging" can be assured that the forger will not give away material for which he is not paid in labor savings, and that if more accuracy is wanted it will have to be paid for.

Here is another problem. Large rolled gear rings when received were found to have had cut away from the periphery at one place a piece big enough to clean up into an impact-test piece. The rings had been charged by weight, which meant that about $\frac{3}{4}$ in. more face-width had to be paid for and money spent in removing it. Suppose that some purchasing agent had ordered these rings, that test pieces had been required, and that the drawings or the specifications had called for the customary $\frac{1}{4}$ in. Where would the test-piece have come from? Seriously, however, would it be practicable to roll rings with a projecting piece in order to avoid such waste?—A question asked for personal education.

What allowance should be made for the distortion due to the stresses induced by forging is another question not easily answered. It applies to rolled bars also. In one job the trouble was this: The forgings, after the first cut, yielded to the stresses, becoming bent sometimes as much as $\frac{1}{4}$ in. in a length of 6 ft. Straightening introduced other stresses which reacted partly at the finishing cut, necessitating further straightening, and partly after the grinding. The machining allowance was increased by $\frac{1}{2}$ in. without, however, entirely eliminating the final distortion, which later was avoided only by annealing after the roughing cuts. Forging stresses would, of course, have been eliminated by annealing the forging. But if these were unequal, the forging would still yield, necessitating allowance, if recourse were had to straightening, because the stresses thereby introduced would necessitate further annealing.

They Don't Speak Our Language—*Discussion*

FORREST L. JOHNSON
Tool Designer, Westinghouse Electric & Mfg. Co., Mansfield, Ohio

THE importance of standardization cannot be overemphasized, and its advantages are apparent to most of us. *American Machinist* deserves commendation for its work on standardization and now offers investigation and study as to what can be done with regards to the collecting and standardizing of names for the same object (Vol. 75, page 944a). This important subject deserves and will receive cooperation from readers throughout the globe.

The author has had experience in a number of plants located in the Middle West and is acquainted with the different shop terms and expressions used. For example, we will take the familiar die set—a die set consists of a punch holder, a die (holder or shoe) two or more guide pins, guide posts, guide rods, standard pins, leader pins, pilot pins, liner pins, master pins, or pillars for accurately holding the punch holder and die holder in alignment, also forming a complete unit which may readily be applied to a machine.

The nine terms mentioned are used in the different plants, text books, catalogs, magazine articles, commercial die set data sheets and daily discussion, resulting in confusion and costly errors.

The author is in favor of calling these pins, used for holding the punch holder and die holder in alignment, master pins and master bushings or leader pins and leader bushings, because on certain die designs, pins and bushings are used to hold certain relations or alignments between die parts, namely punch, stripper and locators on a shaving die. The most natural name would be guide pins and guide bushings. Using the same expression in both cases causes confusion. What is your opinion?

Precision Measuring Instruments—*Correction*

OLIVER P. VAN STEEWEN
Berlin, Wilmersdorf, Germany

In my article under the above title (*AM*—Vol. 75, page 667) I inadvertently ascribed Fig. 15, a combination height and diameter gage for pistons, to Messrs. Krupp. It is, however, manufactured by Messrs. Fortunawerke of Cannstatt - Stuttgart, the company which also manufactures Hirth Minimeters.

How to Make Carbide Tools Pay

J. M. HIGHDUCHECK
Manufacturing Equipment Department
Westinghouse Electric & Manufacturing Company

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The introduction of tungsten and other cutting carbides has been marked by so many instances of notable success that it is timely to review the state of the art. The author points out that in many plants unfavorable results may be traced directly to ignorance of the characteristics of these materials and to the lack of a systematic method in applying them

Sharpening is best done in the main tool room by an experienced man. The illustration shows a tool being diamond lapped

THREE YEARS ago, the machining public was asking, "What is cemented tungsten carbide? They say that it cuts a screw thread in a glass rod, bores a smooth hole in a block of concrete, machines the hardest of steels, and cuts porcelain on a lathe—things difficult with present-day cutting tools, are now possible at two or three times faster speeds." The answer came back, "Why, it's a new cutting material. Its remarkable cutting qualities will revolutionize manufacturing methods." And so, after three years' experimenting, we pause for a brief review to find out what the excitement was all about, and if our new visitor is here to stay.

Generally, when new inventions are introduced, they carry much enthusiasm and advertisement. Sometimes, new ideas come in at an opportune time. For a long time, the machining public sought a cutting material to compete with engineering developments in steels. And so, when cemented tungsten carbide was introduced, it met with welcome invitations everywhere. Cemented tungsten carbide may be likened to any new product. In spite of its tremendous possibilities, it also has certain limitations. Unfortunately, at the early introduction of this material, its limitations were underestimated by both the supplier and the user. Optimism ruled beyond control with the result that much grief was encountered. However, in spite of these setbacks, many users soon recognized the fact that economical success lies not in

RULES GOVERNING THE APPLICATION
OF
TUNGSTEN CARBIDE TIPPED TOOLS

Rule 1-- Analyze carefully every recommended application before applying tungsten carbide tools.
Rule 2-- Give operator all instructions possible. He appreciates new ideas.
Rule 3-- Organize the manufacturing equipment department into a separate division for handling tungsten carbide tipped tools. If one division is responsible for purchase, design and application of tools, best results are obtained.
Rule 4-- Tungsten carbide is expensive - exercise great care in the selection of tools for each application.
Rule 5-- Have a sufficient number of tools for each setup. All tools require sharpening and the operator should not wait while tools are being resharpened.
Rule 6-- Recommend standard tools wherever possible. Inform the operator of the cost of these tools. Keep them sharp and have a suitable place in which to store them when not in use.
Rule 7-- Consider tungsten carbide tipped tools in the same light as a micrometer and other expensive tools.
Rule 8-- Change the tool when it requires regrinding. Do not push it when dull. Teach operators to use honing stones, thus avoiding frequent resharpening of tools.
Rule 9-- Tungsten carbide tools may be ground wet or dry.
Rule 10-- Use diamond lapped edge on cutting tools, especially for finishing operations. This will give the tool a longer life and a finer finish can be had.
Rule 11-- Satisfy yourself that the overhang of the tool is not more than 1-1/2 times the height of the tool and that the largest tool possible of the solid shank type is being used. Demonstrate to the operator the possibilities of this material with each application.
Rule 12-- Run the machine at specified feed and speeds, and teach the operator never to stop the machine on a cut. He should always disengage the feed before stopping. Do not use a too heavy feed on castings of frail construction. The work will spring away from the tool and cause a variation in size.
Rule 13-- Lathe tools have been designed for specific purposes. Do not use them in boring mills. Ascertain that the machine upon which the application is being made is in good condition.
Rule 14-- Obtain the operator's cooperation; united ideas give best results.
Rule 15-- Endeavor to make each application a success. Have no more clearance on tools than is absolutely necessary. Have all cutting tools ground on the bottom after hardening. If the bottom is uneven, it is liable to break when clamped in position. Provide supports for all tools as near as possible to the cutting edge. Lack of support sometimes causes unnecessary breakage and shatter. Avoid sharp corners on roughing tools. Feeds and speeds are governed by the depth of cut, the amount of scale, the kind and hardness of material, and the angles of clearance and the top rake on the cutting tool.

Manufacturing Equipment Department

Recognition of the limitations of the new material is essential to its proper application. Written instructions to the operator serve as a constant reminder of the precautions to be observed for the best results with tungsten carbide

taxation of this material to its limits, but in a system of introduction, distribution, and control.

Many of the representatives of this material were climbing to much higher performances than was economically wise for the users; as a result, many of the users lost faith in the ability of the material. As time went on, the suppliers discovered their expensive mistakes, bravely acknowledged them, and by reorganized effort, again rebuilt the enthusiasm, securing the most practical personnel possible, and by and by, again selling the users the merits of the material. Today, we know in general the ability of cemented tungsten-carbide cutting tools. By special organized set-ups, it is being profitably applied.

Careful Control and Instructions

When the first tools were purchased by the Westinghouse Electric and Manufacturing Company and placed in production, each application was introduced by a demonstrator who understood the full merits of this material and who could operate any machine as well as the operator on the job. Fixed rules were adhered to by the demonstrator regarding feeds and speeds. Each application was watched until the operator agreed that he could maintain these speeds. For every application, two sets of tools were provided. These tools were charged to the operator by a check system. The operator was instructed carefully as to the weak points; and in addition, he was provided with printed rules to avoid misunderstanding the instructions given by the demonstrator.

Every tungsten-carbide application was recorded. One copy of the report was mailed to the timestudy department and one copy to the tungsten-carbide division. The third copy was for the demonstrator's record.

Every tungsten-carbide tool, large or small, is numbered and on record. This record shows the date and purchase order number, cost, the size and type of tool, the division the tool is assigned to, the grade of material, and the number of times the tool was resharpened. When an operator is assigned to operate a machine, which is equipped with tungsten-carbide tools, he is charged by the toolroom with every tool on that application. If the tools become dull, the operator, by presenting the dull tools at the toolroom, can receive duplicates. The tool room will cancel the dull tool from the operator's record, and record against him the sharp tool. No two tools carry the same number regardless of size or type.

In a large plant, it is always difficult to keep the different sub toolrooms from losing tools, especially when all cutting tools are resharpened by the main tool room. To overcome this condition, the sub toolroom requisitions its tools by type and serial number. The sub-toolroom tender is responsible for noting on the requisition the classification of the reconditioning of the tool. These tools are sent to the main toolroom and resharpened by an experienced tool grinder.

In the Toolroom

At the main toolroom, there is a board on which are five tools representing different steps in the manufacture and maintenance of cemented tungsten-carbide tipped tools. Class A is a new tool, Class B is one with the tip broken off, not more than twenty per cent of the original size; Class C, a dull tool; Class D, a tool requiring hand honing; Class E, a tool generally used for fine finishing which is always highly diamond lapped. These classifications have time studies in respect to type and size of tool, and the man reconditioning these tools is

Hit-and-miss methods of application are costly in the long run. Comparative records remove the guesswork from each individual job

Every tool is numbered. A record is made of each grind as to date, form, and classification. Copies are sent to the timestudy and tungsten-carbide division

TUNGSTEN CARBIDE DEMONSTRATION REPORT
on cutting tools

Report No. 9.A.1 Date 11/30/29 Division Gen.App. Dept. A-11
Foreman Snyder Demonstrator H. C. Hulsman
Operator Dockerty Type of Machine 6' Mill
Check Number 33 Column Number 8
Material Semi Steel Drawing No. Various Item No. Various

COMPARATIVE DATA

Previous Record		Present Record	
Former Speed FPM	45	Present Speed FPM	120
Former Depth of Cut	3/8 to 1/2	Present Depth of Cut	3/8 to 1/2
Former Feed	.068	Present Feed	.068
Former Pcs. Per Grind	Several grinds to 1pc.	Present Pcs. Cut Per Grind	2 to 4
Former Tool Material	H.S.S.	Present Tool Material	Tungsten Carbide
Coolant	none	Coolant	none
Remarks on Old Method	Photo 183412, 183413 was taken showing tungsten carbide tools.	Remarks on new method	This job is intermittent cutting and very severe on the tool. However, very good results are obtained even under this condition.

Condition of Machine and Fixture Good

Was Speed Limited By Capacity of Machine No, by the work

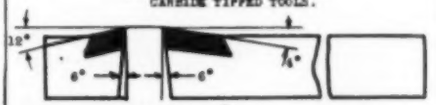
What Tools Will Be Ordered As a Result Of This Demonstration 2-108-E, 2-127-E, 2-130-E, 2-109-E

MANUFACTURING COST REDUCTION

Part Name G.I.Frame Drawing No. Various Item Various
Operation Turn, bore, face complete
Cost Per Piece Old Method 14.67 Cost Per Piece New Method 6.69
Activity Yearly Savings Per Year

Approved By Time Study Dept. E. L. Emens
Approved by Supt. J. E. Barkle Tool Supv. F. Smale
Approved By Mfg. Equip. Dept. J. N. Highduchesk Date 11/30/29

DAILY
GRINDING REPORT OF TUNGSTEN CARBIDE TIPPED TOOLS.



Angles ± 0°
Date. Aug. 10 1931 Division. Small Tool

Tool No.	Div. or Dept.	Classification of Gr.	Tool No.	Div. or Dept.	Classification of Gr.
403	B,C,D	B	388	B,C,D	C
372	"	"	389	"	"
783	"	C	390	"	C
894	"	"	1076	"	B
880	"	"	884	"	"
827	"	"	180	"	B-1
844	"	B-1	376	"	D
2648	"	"	378	"	B-S
891	"	"	898	W-S	C
1487	"	"	18	"	"
1168	MAD	C	84	E	"
2873	"	"	87	"	"
2872	"	"	2477	E-90	E
889	B,C,D	"	2478	"	"
844	"	"	1297	MD	C
499	"	"	1298	"	"
843	"	"	1888	"	"
472	"	"	636	MAD	B
470	"	"	1194	"	"

Workman's Signature. Holmes Check No. 5
Inspected by. A. Smith Date. 8/11/31
Approved by. A.G. Freeburn Time Study Dept.
This form is to be turned in daily by the Time Study Department to Foreman of W-54 after approval.

Even carborundum succumbs to the extreme hardness of tungsten carbide. Several grinding wheels were salvaged by making use of this fact

paid accordingly. On this board, a sketch is displayed showing the correct and incorrect method of grinding. The main tool room records the classification and the tool number on a form. This is approved by the time-study department inspector and then sent to the tungsten-carbide division to be placed on record and file.

There are many factors to be considered in determining the proper and economical use of tungsten carbide. Most of these various factors, however, have been overestimated. In general, the machining public looked upon this strange material only when nothing else would do. Here they expected almost miracles and often would not consider a demonstration unless they were shown such. It is true that many of these stunts convinced users that the new cutting material had wonderful possibilities; but on the other hand, it also left an impression on some users that it was for only such purposes. I remember on one occasion the carbide representative insisted in speeding up a fifteen-year-old boring mill tooled with tungsten carbide to three times the speed formerly used with high-speed steel. After breaking two tools, he was satisfied to reduce the speed to double that of high-speed steel.

Avoid unnecessary difficulties — they only have a tendency to retard the progress of new ideas. Satisfy yourself on lower speeds, and your tool life in the set-up will be considerably longer and your ultimate tool cost will be much lower. For example, a boring mill machined cast iron with high-speed steel operated at 90 surface feet per minute. After introducing tungsten-carbide tools, the speed was jumped to 300 feet per minute. At this speed, it became necessary to resharpen the tools every four hours; and during this test, two tungsten-carbide tools were broken, proving that the speed was too high. After decreasing the speed from 300 to 180 surface feet, it was possible to operate the machine continuously for two weeks without changing the tools.

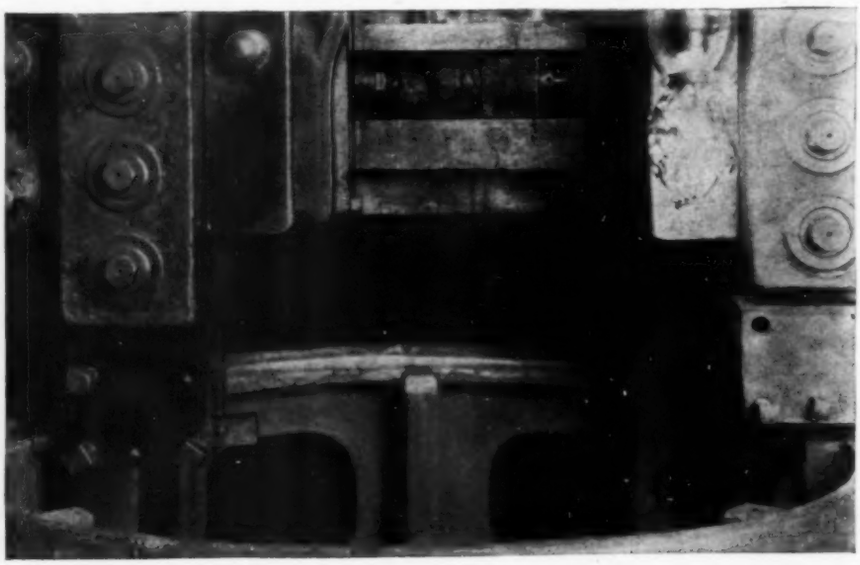
The Foremost Advantage

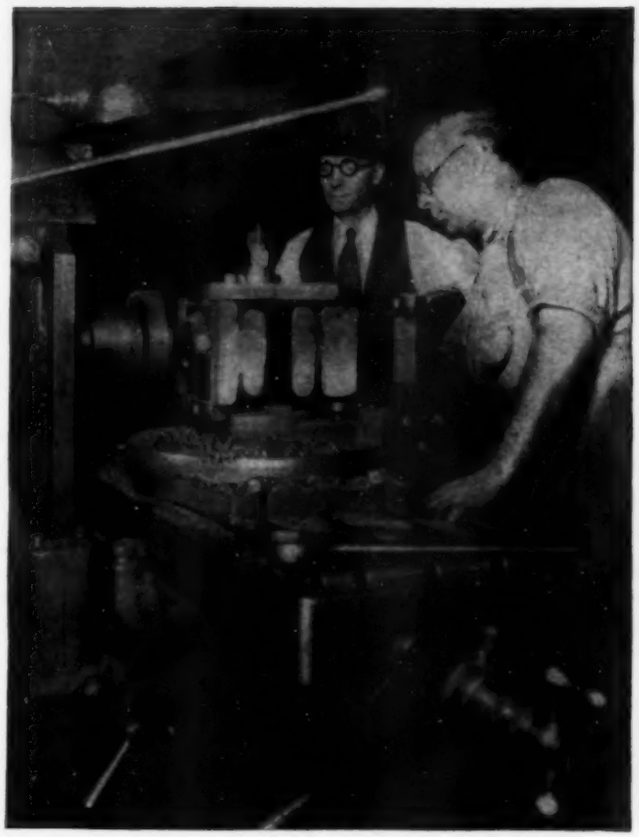
The foremost advantage, of course, is the increase in speeds possible with the same feeds and depth of cut, thereby removing more metal in a given time. Sand and scale may usually be cut without harmful effects where high-speed steel tools would not cut. A number of carborundum grinding wheels were obsolete and about to be scrapped. A suggestion to face off the excess thickness with tungsten carbide made it possible to salvage these wheels which otherwise would have been scrapped. The feed used used was 18 thousandths, speed 60 surface feet per minute on an 18-in. diameter, and the depth of cut was $\frac{1}{4}$-in.

It is quite true that the machining public even today, regard tungsten carbide impractical in machining materials which have surfaces interrupted by cored pockets. This, of course, is because so often upon investigation of such failures, practically every case shows that the tools were undersize, and that the incorrect grade of tungsten carbide was used.

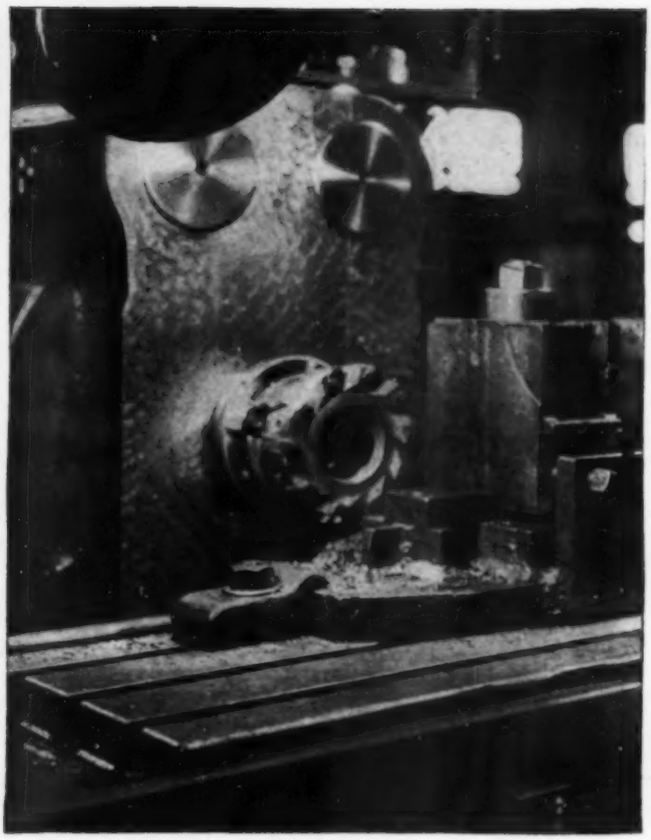
The remark is often made, "We can't use cemented tungsten carbide because the machine is too old and slow, and our activity is small." Such statements require investigation. Never pass up a tungsten-carbide application until you are satisfied that it cannot be done on your old machine. Frequently a little tightening here and there, changing the drive pulley from cast iron to paper,

This semi-steel motor frame was formerly machined at a surface speed of 45 feet per min. with high-speed steel. With tungsten carbide, this speed was jumped to 120 feet, using the same feed and depth of cut





An 8-in. diameter cutter mills semi-steel at 225 feet per min. with a $\frac{3}{16}$-in. depth of cut and a 16-in. table feed



A full back tungsten-carbide cutter machines cast-iron receptacles at 250 feet per min., depth $\frac{3}{16}$ in., and a feed of 19 in. per min.

or increasing the horsepower of the motor, makes it possible to run the twenty-year old machine equipped with tungsten carbide at a profit. Of course, machine tool builders are now placing on the market machines which can take full advantage of this super-cutting material, and before long, it will not be the question of machine tools but good judgment on the part of those in charge of the application.

Recent developments, employing the proper kind of equipment, are proving conclusively that milling is one of the most practical uses to which tungsten carbide can be applied. Since the cutting load is divided among a number of teeth long life is assured—five to ten times greater between grinds than is possible with other milling cutters, and considerably longer life than could be expected with any single point cutting tool. Successful milling with tungsten carbide depends entirely upon rigidity. The importance of this point cannot be emphasized too strongly. There must be rigidity in the machine, the holding fixture, and the milling cutter. Lack of rigidity is the worst evil cemented tungsten carbide can meet.

The body of the cutter illustrated is heavy and strong with brute strength to withstand the faster speeds and feeds. The blades are of heavy proportion to avoid cutter vibration. The cutter body is case-hardened to resist wear, and each tooth is solidly supported almost flush with the cutter blade. Chip clearance is provided by milling a recess in the body ahead of each blade.

Plymouth Machining Methods—Amplification and Correction

IT WAS stated in the original article (*AM*—Vol. 75, page 632) that boring bars for the cylinder boring operations are fitted with hardened wear strips. Although some of these bars are still in use, it has since been learned that they are being replaced rapidly by the present standard Plymouth bars which are of nitrided steel with nitrided pilot bushings.

An erroneous impression of the cylinder reaming operation might easily be gained from the original article, that single-spindle reaming machines only are used. As a matter of precise fact, four single-spindle Foote-Burt columns are mounted on the same base. All four bores of a particular block are reamed by the same reamer in order to secure bore diameter uniformity in that block. At capacity, one man operates eight spindles.

For some reason, as yet unexplained, the relative positions of high speed steel and Stellite were reversed practically throughout the article. Stellite, of course, is used for the roughing cuts, and high speed steel for the finishing cuts, except in one or two cases where Stellite is used for both. The standard feed for Stellite on all jobs is 15 to 16 in. per min. For the first operation in the Plymouth table (page 634) the floor-to-floor time should have been 1.71 min. instead of 5.148 min. The true speed for this operation is 121 ft. per min., and the speed of the finishing cutters is 92 ft. per min.

NEW BOOKS

FRANKENSTEIN, INCORPORATED—*By I. Maurice Wormser, LLD., Professor of Law, Fordham University; Editor, New York Law Journal. 242 pages 6x9 in. Bound in cloth boards. Published by Whittlesey House, McGraw-Hill Book Co., Inc., 330 West 42nd St., New York. Price $2.50.*

As might be guessed from the author's professional connections his book leans to the legalistic in phraseology and is consequently fairly heavy going for the layman The first half of it, which outlines the history of corporations and their growth to their present gigantic proportions, is particularly difficult to become excited over. Yet it is worth the effort of reading because it establishes the foundation for the later discussion of the existent evils and potential dangers of corporate concentration which is well worthy of the careful study of any thoughtful business man.

Dr. Wormser makes it very clear that if means are not found to keep the corporation within the bounds of public service, either by force or by the awakened consciousness of the directing officers, it will almost certainly overwhelm us. His remedy for the malady is a commission, constituted of five members ranking with Supreme Court justices, to tell business men seeking honestly to balance production with consumption how far they may go, and whether what they propose to do is within the law.

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THE BALANCING OF MACHINERY—*By C. Norman Fletcher, A.M.I.L., Mechanical Engineer. 172 pages 5½x8½ inches. Bound in cloth boards. Published by Emmott & Company, 28 Bedford St., London, W.C.2,. . Price 10 shillings.*

This book is a practical treatise on unbalance, both static and dynamic. It begins with a description of the simplest form of static balance apparatus, and follows through various steps to different examples of dynamic balance. Only commercially available apparatus is presented and discussed, and the author has drawn upon all the available sources for information.

The final chapters of the book take up the balancing of reciprocating masses, foundations, assembled mechanisms and engines. Resonance, critical speed and time lag are also discussed from a practical aspect. The book is a complete compendium of its subject and should be on every engineers' book shelf.

NOISE AND VIBRATION ENGINEERING—*By Stephen F. Slocum, Ph.D., consulting engineer. 171 pages, 6x9 in. 74 line drawings. Indexed. Cloth-board covers. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. Price $2.75.*

Vibration has long been a bugbear of the shop executive and engineer, but until recently little attention has been paid to the aesthetic or social and economic aspects of the subject. Only recently has popular opinion risen in revolt against unnecessary noises and vibration. Some books of more or less consequence have appeared on this general subject, but this is a pioneer work on the various aspects of vibration in engineering, commercial, industrial and civic lines. It presents a practical rather than a theoretical treatment of the subject and serves to indicate the way into this new field of engineering.

It opens with an introduction which summarizes the problem of vibration control. This is followed by a study of the characteristics of elastic ground waves and their transmission to earth, sand and rock. The author has made. an experimental study of vibration dampers and insulators and describes the results of this study and the methods of vibration insulation in various buildings and machines. Production men will be particularly interested in Chapter VI on "Machinery Insulation, Sound Deadening and Acoustic Correction." The volume will be found to be a readable addition to the engineers' library, covering a subject which has thus far been explained by very little published information.

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THE ABOLITION OF POVERTY—*By Harrison E. Fryberger. 152 pages, 7¾x5 in. Introduction. Appendix. Cloth board covers. Published by the Advance Publishing Company of New York City, Chrysler Building, N. Y. Price $1.50.*

"Checkmate Communism!" is the subtitle of this book which deals with the evils of capitalism and proposes various legislative remedies. The author believes in the superiority of capitalism over any other system of human relationship, but he points out that as things are now going in America a reaction is certain to come, and communism or some other undesirable system may be thrust upon us.

The primary evil of capitalism is the concentration of the major part of the country's wealth in a few localities and in the hands of a few individuals. To remedy this, and the author shows quite clearly the need for remedy, he proposes to abolish the chain store, break up the large corporations, regulate stock exchanges and place effective check on stock swindles, and last, but not least, break up large estates by a law which would permit an individual to inherit only a certain fixed sum, all surplus to revert to the government.

While this is not one of those dynamic books which rock the foundations of our social and economic structures, it does add something appreciable to the reservoirs of thought and latent feeling out of which, in full time, there is sure to come such correction as our faulty capitalistic system may require.

IDEAS from PRACTICAL MEN

Blanking Tools for Tough Material

C. M. GRIFFIN
Manager, Condenser Cleaners Manufacturing Company

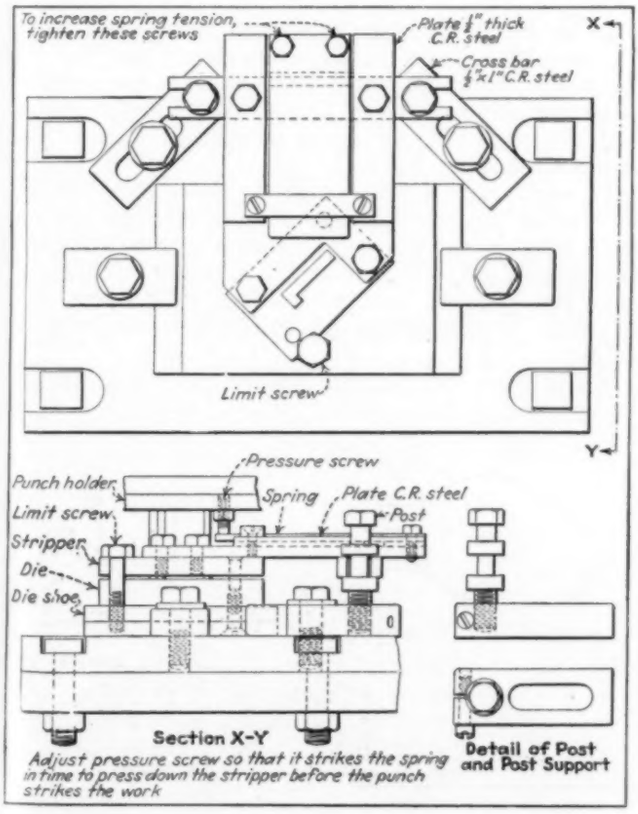
IN punching tough metals, such as stainless steel, which make frequent grinding, reworking and replacement of press tools necessary, it is important that the dies be designed so that they can be easily made and easily taken down. The accompanying illustration shows a design that has been found to be good.

This design combines the pad stripper, that bears down on the work while it is being punched, and the solid stripper, that remains on the die and permits the use of the automatic stop-gage. It also eliminates many screws, springs, dowel pins, and leader pins, thus saving much of the diemaker's time. The stripper spring consists of a single flat-leaf spring mounted in a groove in the "plate." The plate, which is attached to the crossbar, is held in a level position by the posts.

In taking down the die for grinding, plate, crossbar, and posts remain on the press. It is necessary only to remove the two screws that hold the plate to the stripper and the clamps that hold the die to take the die out of the press. The only dowel pins are the two (more might be used on large dies) that serve as leader pins and keep the stripper in alignment on the die. The same holes in the die may be used for the dowel pins and for the screws that hold the die in the dieshoe, by tapping only halfway through the die for the screws and using the upper halves of the holes for the dowel pins. The dowel pins, which may either be hardened or left soft, are made a drive fit in the stripper and a close working fit in the die.

Cold-rolled steel is used for the dieshoe, stripper and punch-holder. The stripper is made a close-working fit on the punch to guide the punch in the die. It is evident that this design can be used only where the movement of the stripper can be limited to about $\frac{1}{16}$ in. The limit screw prevents the stripper from rising too high and cramping the punch. The posts only hold the plate level. They are a loose fit in the crossbar and are easily set so they do not hold it in position horizontally.

An advantage of this design is that the same spring, plate, crossbar and posts can be used in a number of dies. Thus not only the assembling, but also the handling of a large number of springs, screws, dowel pins and leader pins is eliminated. Dies of this design are used for punching the stainless-steel blades of cleaners for condenser tubes.



Tools for Transferring Holes

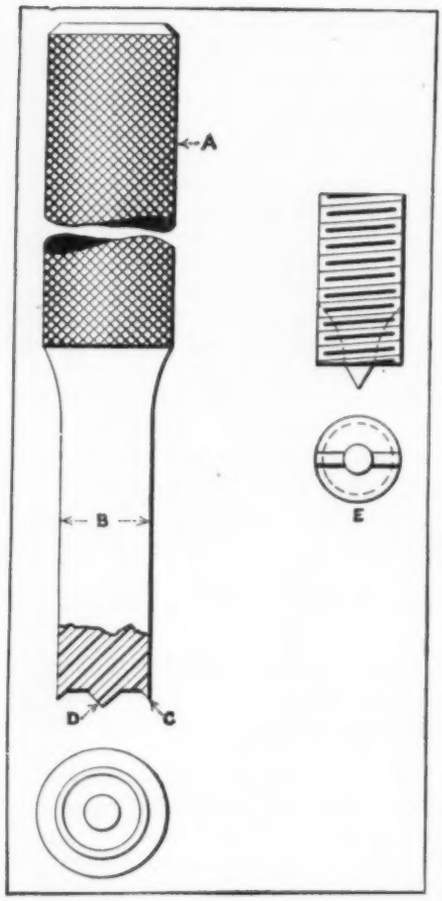
EDWARD HELLER

The two tools shown in the illustration are useful in the toolroom or in the machine shop, and will save their cost in a short time, where many holes are to be transferred.

At *A* is a marking center punch for transferring the location of holes from one part to another where the holes that can be drilled first are the clearance holes for screws. The diameter *B* is of the size ordinarily used for clearance holes, such as $\frac{17}{64}$, $\frac{21}{64}$, $\frac{13}{32}$, and $\frac{17}{32}$ in. With the parts in place, the tool is put through one of the clearance holes and is struck with a hammer. The edge *C* makes a well-defined ring for checking the start of the drill, which the point *D* makes a good center in the work. The advantage of using this tool over the usual method of scribing a circle around a center punch mark is obvious.

Tools such as the one at *E* are useful where the location of blind tapped-holes must be transferred to the part in which clearance holes are to be drilled. The method, by which this operation can best be done, is often a bone of contention between workmen. With a number of these little tools, the transferring of from blind tapped holes in one part to clearance holes in another part is just as easy as if the holes were through ones.

Slots are milled on each side of the point to provide



means for inserting or removing the tool with a split-pointed screwdriver. To prevent dirt in the tapped hole from interfering with the insertion of the tool, the first part of the thread at the top is removed, leaving a square end.

The tools are screwed into the tapped holes, the points projecting about $\frac{1}{32}$ in. The two parts of the work are then brought into position, and the upper one is given a sharp blow with a hammer, the points making center punch marks in the part in which the clearance holes are to be drilled.

A half-dozen sizes of these tools will probably answer the requirements of most shops. It should be noted, however, that while one of each size of the tool *A* is all that is required, the tool *E* may have to be provided in quantities of each size, depending upon how many blind holes are in the part from which they are to be transferred. But in any case, the tools are so easy to make that it is well worth while to make enough of them in the first place, so as to cover every possible contingency.

Another Use for Compressed Oxygen
Discussion

B. HEYMAN
Chief Draftsman, Anchor Post Fence Company

Without doubt, the application described by A. J. Karlson (*AM*—Vol. 75, page 641) is ingenious and might prove unusually useful in an isolated plant where neither air nor water under pressure could be obtained. One thing, however, must be remembered; in fact, it is of such importance that failure to heed it may result in a catastrophe. That is to be certain there is no oil or grease in the closed vessel into which the oxygen is introduced.

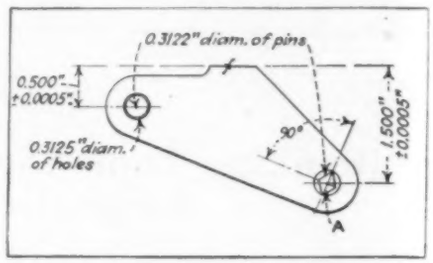
On all oxygen regulators, the statement will be found: "Use no oil." Oxygen, in combination with oil or grease, acetylene and other gases under pressure, or in a closed vessel, forms a highly-explosive mixture. If the vessel to be tested is free from any of the above-mentioned elements, the oxygen can be introduced without any fear of danger.

Locating Pins for Fixtures

C. COLE

Sometimes it is necessary to locate work in fixtures by pins engaging two holes drilled in a previous operation. Many toolmakers make both pins round, and in order to compensate for variations in the center distances of the holes in the work, they greatly reduce the diameters of the pins to make loading easier. In reducing the diameters of the holes there is danger that the work will shift in the fixture under pressure of the cut.

In some work such slipping would not matter much, but where the limits are close, as shown in the work in the illustration, the pins can be 0.0003 in. smaller than the holes and one pin can be slabbed off as indicated at *A* allowing it to contact only at two sides of the hole. The points of contact should be at a right angle to a line drawn through the centers of both holes in the work. The work will then slide over the pins in spite of some variation in the center distances of the holes.



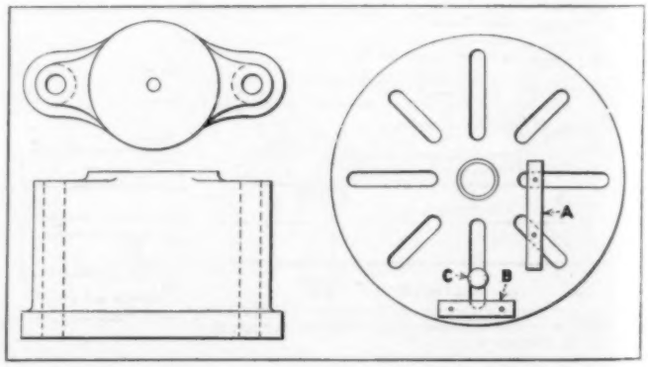
Boring Die-Sets for Leader Pins—
Discussion

DONALD RAEBURN
Glasgow, Scotland

In an article under the title given above (*AM*—Vol. 75, page 181), James R. Cornelius clearly describes his method of doing the work. While this is less cumbersome than that outlined by Charles A. Archbold (*AM*—Vol. 74, page 587), it seems possible to improve the means of locating the work.

In machining the surfaces of the dieset, shown in the illustration, an additional machining of the sides and the ends, together with the use of a correctly ground pin, and two parallel strips secured to the faceplate, would give easy and positive location for leader-pin holes, and would be an asset where quantities of diesets are to be made.

To prepare the faceplate for setting the work for boring the first hole, parallel strips *A* and *B* are set in



position by measuring from a mandrel fitted to the center hole of the spindle. The parallel strip *A* must be vertical and its distance from the center of the mandrel must be equal to one-half the width of the casting. The parallel strip *B* must be horizontal and must be set to correspond with the distance from the end of the casting to the center of the first hole to be bored.

To set the casting for boring the second hole, the locating pin *C* should be secured to the faceplate at a distance from the center of the spindle equal to the center distance of the holes, and should be engaged in the first hole bored. If a 1-in. hole can be drilled through the center of the casting, it can be used for a bolt to fasten the work to the faceplate, making clamps unnecessary and leaving ample room for a counterweight. A sheet of thin paper placed between the work and the faceplate will help to keep the work from shifting.

By boring the first hole in both members of all the diesets of the same size in the batch, all the second holes can be bored without removing and resetting the locating pin, and both holes in all the members will be in accurate alignment.

Pipe Bends With Sharp Inside Corners

GEORGE D. TAYLOR

Some time ago the experimental department of our plant wanted some right-angle bends of ¾ and 1-in. ordinary black pipe, the inside corners of which were to be sharp, as shown in Fig. 1 at *A*. Requests for such bends to several pipe-bending concerns were rejected as not being feasible. As a last resort, our manager asked me if I thought I could make the bends wanted.

When the question of the bends first came up, I had a hunch that I would be asked to try my hand at the work, so I considered several methods by which I thought the bends could be made. Since the inside corners were to be sharp, it was quite clear that the pipe must be bent while hot; also that filling the pipe with sand, resin, or an easily melted or flexible substance would not do. The filler, or core, must be rigid and fairly easy to remove. After due consideration I tackled the job.

For a core, I used two pieces of cold-rolled iron, one having a tongue at one end. The other piece was slotted to fit the tongue and the end was rounded, all as indicated in Fig. 2. To provide for removal, each piece was drilled and tapped, and a piece of flat iron was attached for a cross-handle. The bending was done in an ordinary vise, using a small sledge. Before heating the pipe, the core was assembled and marked for location in the pipe, and the pipe was marked for location in the vise.

When all was ready, the pipe was heated to a good red heat, clamped in the vise, and the core was inserted. A few smart blows of the sledge on the projecting end bent the pipe to an angle of about 45 deg. before it had cooled off too much, when the core was removed. A mandrel having a rounded end was driven into each end of the pipe to straighten it. The pipe was then reheated and held in the vise. The core was inserted and the pipe was bent to 90 deg. During the bending, the tongue in the end of one piece of the core would pull out of the slot in the other piece so it was necessary to reheat the pipe after pulling out the core and to drive in the round-ended mandrel at each end to make a good-looking job.

As I had an extra bend, I sawed it through at the elbow, see *B* Fig. 1, to show how the metal stretched and thinned at the outside of the bend, and how it upset and thickened at the inner corner.

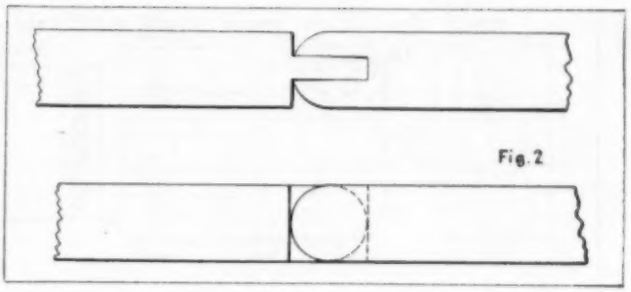


Fig. 2

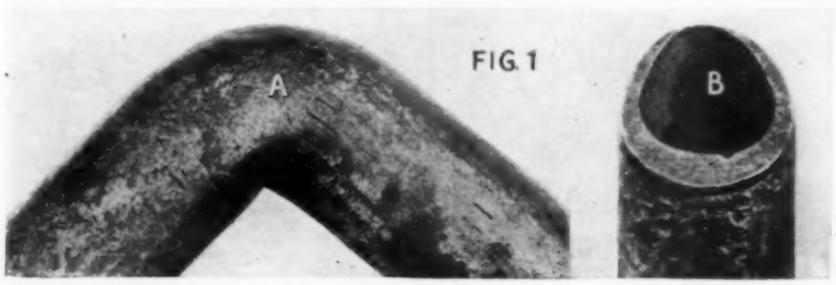


FIG. 1

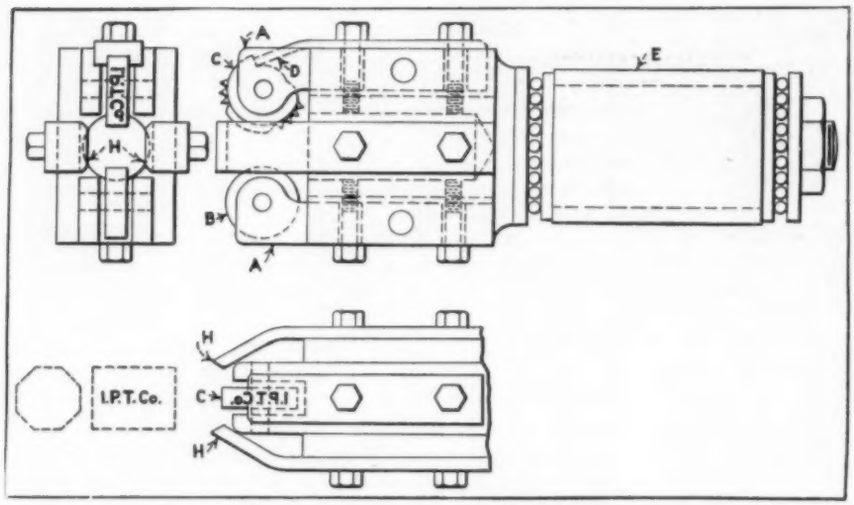
A Marking Tool for the Automatic Screw Machine

A. J. WORMWOOD
Independent Pneumatic Tool Company, Aurora Plant

At one time we used a punch press to cut to length and to stamp our trademark on certain parts made from octagon and square steel. Then the parts were trucked to hand screw machines in other departments for the finish turning operations. Now all operations are performed in four-spindle automatic screw machines, the marking being done by the tool illustrated.

The body of the tool is slotted to receive the two adjustable arms *A* that carry the supporting wheel *B* and the marking wheel *C*. The marking wheel is partially cut away on its periphery to limit its travel as it contacts with the flat spring *D*, keeping the markings on the wheel in proper position relative to the end of the work and preventing the wheel from spinning around as it is pulled off of the work. The shank of the tool is a running fit in the sleeve *E*, which fits into the turret. Since the tool is revolved by and with the bar stock during the marking operation, ball bearings are provided at each end of the sleeve to take the thrust of the tool as it is fed on and off of the work.

As the tool is fed forward, the revolving stock contacts with the slightly bell-mouthed ends of the guides *H*, which are also slightly beveled. This contact causes the tool to revolve and brings the marking wheel into line with one of the flats on the stock. The marking



wheel makes its impression as the tool is fed forward. Spurs on its periphery set it in motion before the portion containing the trademark contacts with the stock, and keep the wheel in the right track during the reverse movement. Screws are provided for adjusting the pressure on the marking wheel on the work.

Efficient and Easily-Made Press Tools
Discussion

CHARLES F. KRAUT

In discussing the tools described by Charles H. Willey in an article under the title given above (*AM*—Vol. 74, page 769), Robert R. Cornell (Vol. 75, page 495) assumes that Mr. Willey had some good reason for making the bars out of cold-rolled stock. In this assumption, I concur, as it is common practice to make bar stampings lengthwise of the grain, giving greater strength. It also saves material that would be wasted by spacing between the blanks and by the wide stock that would be necessary.

In Mr. Willey's tools the stock is guided by pins only, which do not prevent it from swerving either to the right or the left, while being advanced, before it contacts with the guide stop pins. Nor has any provision been made to control the stock from above. This means the operator may inadvertently misplace the stock, resulting in serious damage to the tools. The exercise of special care in feeding the stock slows down production.

The sketch, Fig. 1, shows at *A* why, after clearing the blank at *B*, the advance of the stock is obstructed by one of the piercing dies in the lower member and must be elevated by the operator to above the plane of the dies before it can be advanced again. After the blank has been sheared, as the upper member ascends the stripper, actuated by the knockout, forces the blank off the piercing punches, and unless the tools are used in an inclined press, the blank would fall on the lower member. Hand feeding in an inclined press slows down production.

Of course, the tools could be used in a vertical press and the product blown off by compressed air as it is stripped from the punches. But this is only begging the question. Mr. Willey has simply made his tools upside down, thereby decreasing their efficiency. He has made no provision to prevent the shearing of the cutting edges should less than a full blank be sheared. This, no doubt, would occur frequently unless the operator worked carefully, and necessarily, slowly. For the reasons given, I think the production of 2,000 pieces per hour, as stated by Mr. Willey, is the maximum.

If the tools had been made as shown in Fig. 2, they could be used in a press running continuously at 100 strokes per min. This would give a theoretical production of 6,000 pieces per hour. Deducting 30 per cent for handling the stock, the actualy production would be 4,200 pieces per hour. The figures given are taken from actual production records.

In these tools, the stock is fed from the rear, as at *A*, and is advanced to the die opening. The descending punch *B* shears off the end of the bar, and the piercing punches *C* pierce the three holes. The stock is then advanced to the stop gage *D* and is continually advanced against the stop gage at each stroke of the press. The dotted lines show the product after it has been pierced. After being parted from the bar, the product drops, the die being beveled at *E* to allow it to tilt and drop freely.

When the product is sheared from the bar, all the holes have been pierced and both ends have been rounded. The bar from which it was sheared has one end rounded and the three holes pierced. As the punch ascends, the stock is advanced against the stop gage *D*, and as the ram descends, another piece is sheared off rounding the end and that of the stock. The die is shown with the

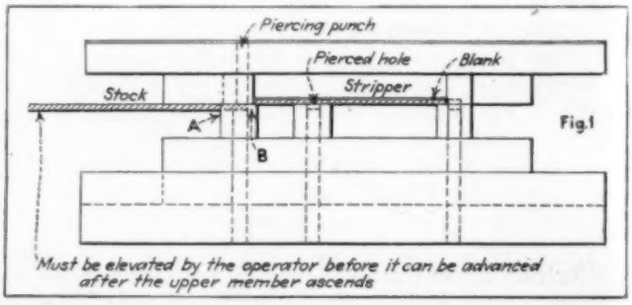


Fig. 1

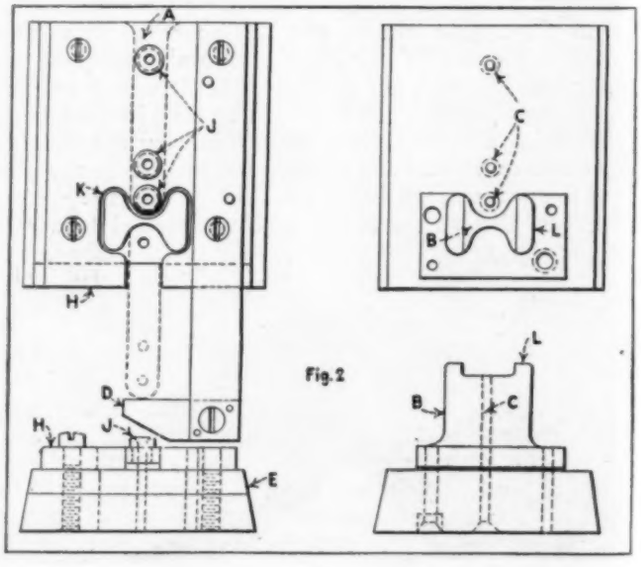


Fig. 2

stripper *H*; the guide bushing *J* for controlling and supporting the piercing punches; and the clearance hole *K* into which the shearing punch passes. The punch-holder carries three piercing punches that are headed and let in from the back. The projecting guide *L* on the shearing punch enters the die in advance of the piercing and parting operations, holding the members in alignment and preventing the shearing punch from shearing the die. It also insures accurate production and long life to the tools.

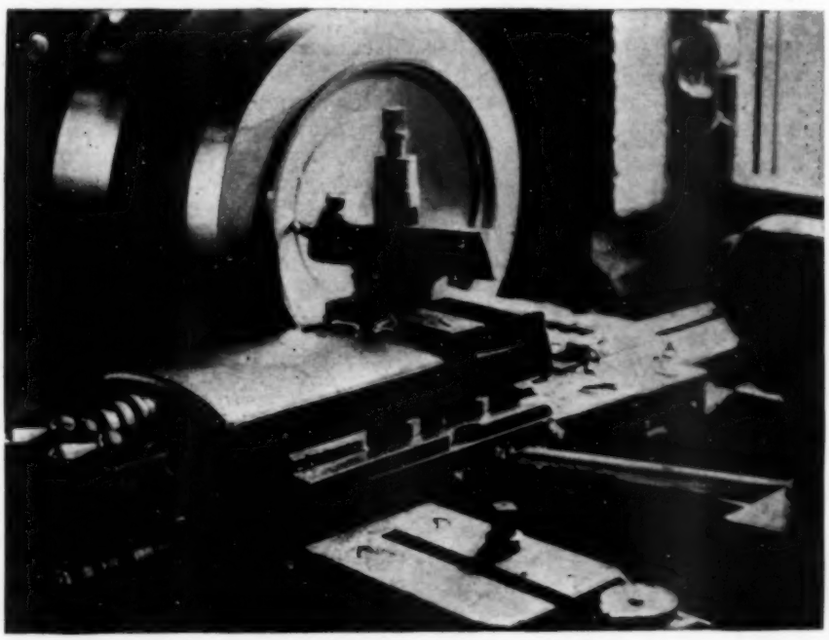
Facing a Concave Surface

H. J. DILLEMUTH

Recently, we had the job of facing some castings concave to a radius of 11 in. and the work was done in the following manner: First we made a rod 11 in. long, pointed at both ends, the points being hardened. This rod was held between the toolblock and the front of the tailstock, directly under the center line of the lathe, the tool being set to the center of the work. With the tailstock clamped to the lathe bed, the carriage was forced to the right, causing the hardened points of the rod to indent both members. Removing the rod, we center punched both indentations.

In operation, the points of the rod are set in the center-punch marks and confined therein by keeping the carriage pressed toward the tailstock. It will readily be seen that with the carriage pressed toward the tailstock, either by hand or by a weight attached to a cord passing over a pulley, feeding the toolblock across the carriage it must move in the path of an arc, the radius of which is equal to the length of the rod. Thus, with the tool in the correct position, the work will be faced concave. The set-up is shown in the illustration. Depth of cut can be controlled by the compound rest when it it set at an angle to the cross-slide. In the illustration the compound rest is shown parallel with the cross-slide, so as not to interfere with the view of the rod.

By setting the rod between the toolblock and the front of the headstock, the work will be faced convex.



Drilling One Hole to Break Into Another

HARRY SHAW
Consulting Engineer, Heywood, England

In his discussion of G. R. Richard's article "Rigid Feed-Attachment for the Drill Press" (*AM*—Vol. 74, page 916), T. E. Jarnigan describes troubles experienced in drilling holes across each other at right angles. This trouble is encountered every day in bicycle works in drilling the cotter-pin holes in cranks, so that the pins will hold the cranks on the crankshafts.

Two favorite methods of drilling these holes are in use. One is to place the cranks on a soft plug located in a jig; then drill, allowing the drill to cut away part of the plug. The plug is turned around a little for each fresh crank and moved along, so that when the plug is discarded very little of its metal has been wasted. The other method is to drill the second hole with a flat-ended drill while the crank is held in a simple fixture attached to the faceplate.

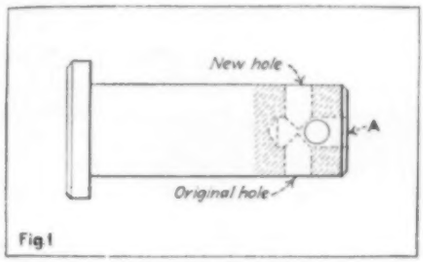


Fig. 1

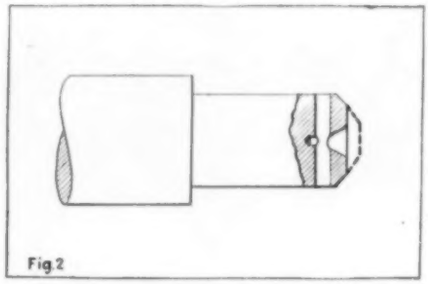


Fig. 2

For drilling two holes across one another as in Fig. 1, I recommend the following as being a simple yet effective way of drilling the second hole so that it crosses the first: Chuck the pin in the lathe and drill the axial hole *A* a little larger in diameter than that of the holes to be drilled across it, and to a depth a little past where the farthest hole will be drilled through. Usually such a hole in the end will not be detrimental. The second cross hole cannot now be deflected from its true path, but will pass centrally across the axial hole. The designer is often responsible for drilling troubles.

In Fig. 2 is illustrated the designer's conception of a means for keeping the shank of a gear as short as is possible. The center being needed for checking the gear for concentricity, it could not be eliminated, nor could any

material, as that shown in heavy dotted lines, be left on. In drilling the cross holes in the shanks of 200 gears of nickel-chrome steel, a score or more drills were broken, and many shanks were spoiled by the point of the drill sliding down the cone of the center, causing the drill to act as a cutter and elongate the upper portion of the hole and then drill the lower portion slantingly. The cure for this trouble in subsequent batches lay in drilling the cross holes before centering and grinding the shanks. Drilling the center holes then caused no trouble.

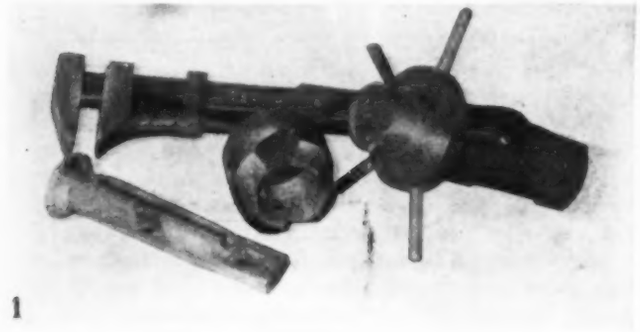
A Double Reseating Tool

FRANK C. HUDSON

Resurfacing valves and valve seats is part of the maintenance work in every railroad shop and in many others. The tool shown is in use in the Roanoke shops of the Norfolk & Western and handles both the valves and the seats. The seating cutters are double ended, the inner ends recutting the seat of the valve and the outer end that of the valve body. Both tool and valve are shown in Fig. 1.

In reseating the valve, the cutting tool is slipped over the end of the valve and screwed down against it, being locked at the proper point by the ring nut with the five radial pins. With the shank of the holder held in the vise as in Fig. 2, the valve is turned by the wrench at the upper end. The tool can be fed into or against the valve by turning it on the threads of the shank and locking by the ring nut.

For resurfacing the seat in the valve body, the outer end of the seating tool is used in the regular manner.



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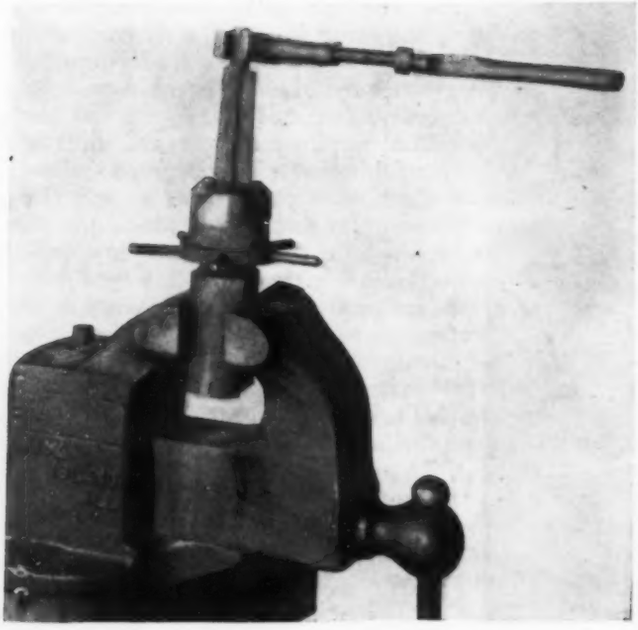


SEEN AND HEARD

JOHN R. GODFREY

Welding in Miniature

Aside from the numerous fine elements used in a radio tube which are minute girders, braces and cross-members, there are 186 spot welds in the final assembly of elements. This is the number of welds required in laying a ¾-mile pipe line of 20-ft. sections. The same number of welds would be sufficient for all steam and water pipe connections in the average home; or to weld an anchor chain 93 ft. long for one of the big ocean liners. Again, a complete plane, including the frame and fuselage, could be securely welded with this number of operations. But the welds in a radio tube are no larger than pinheads.

Holding Crown Brasses in Place

Crown brasses have a way of getting loose in locomotive driving boxes due to the pounding of the wheels over frogs and crossings, plus the thrust of the piston and connecting rods. And many methods have been tried for holding them in place. They are almost always forced into the driving box, and in addition, various methods of studding and riveting are used. One seen recently puts a good sized taper hole in the top of the crown brass with the large end toward the axle, and a reverse taper in the driving box. A bronze plug with a taper on one end is expanded in the other taper with a riveting hammer, and is said to hold very well. The hole is about 1½ in. in diameter and is either reamed in the crown brass or produced by a tapered steel drift pin and a sledge.

How's This for Hard?

Centerless grinder supports (for work passing through the machine) are subject to rapid wear because of the abrasive action of the grit thrown upon them and drawn across their surfaces by the motion of the work. On this account, an extremely hard metal is needed. According to a well-known metallurgical engineer, experiments made in England with supports cast from iron containing six per cent of nickel, have been giving a good account of themselves for over a year. These supports are said to have shown a Brinell hardness number of 500 to 600. Those formerly used in a setup for grinding rollers in a particular instance required regrinding twice a day to maintain the required accuracy of work. The nickel-iron requires regrinding only once a week.

Experiments made in this country for the same purpose involved the use of a cast iron containing 4.29 per cent of nickel, 1.51 per cent of chromium, and 0.95 per cent of silicon. Castings are reported to show a hardness of 683 Brinell, as they come from a mold in which a chill was employed. Data on their performance is lacking. Whatever may be said of times generally, it is evident that iron of the type in question is getting harder and harder—and to good purpose.

SHOP EQUIPMENT NEWS

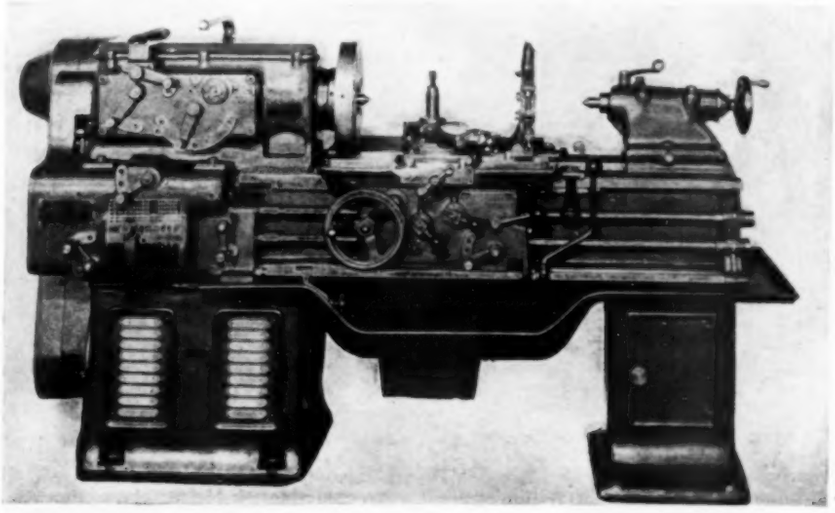
"Tritrol" 16-Speed Geared-Head Engine Lathes

Four additional sizes of "Tritrol" 16-speed, geared-head engine lathes have been added to its line by The Sidney Machine Tool Co., Sidney, Ohio. These additions comprise 14, 16, 18 and 20-in. lathes, which now complete a line ranging from 14 to 36 in. capacity. The machine illustrated is a 14 in. x 6 ft. size, with the geared headstock equipped with herringbone continuous-tooth gears of 30 deg. helix angle. These gears run constantly in mesh, and spindle speed changes are made by engagement of positive-jawed, double-sided clutches which slide on multiple-splined shafts. All shafts in the headstock, including the main spindle, operate on Timken precision tapered roller bearings, although tapered bronze bearings are optional.

Headstock lubrication is obtained through a combination pump and splash system. The oil pump is built directly onto the drive shaft and it supplies filtered oil to a reservoir from which it is fed as a spray.

The quick-change gear box is also completely equipped with anti-friction bearings, and has alloy steel gears giving 48 changes. Threads range from 1½ to 92 per in. and the feeds from 0.0027 to 0.172 in. per revolution. The gearbox is completely dirt- and chip-proof. The improved end-guard design protects the driving belt from oil splashed from the quadrant gears. The lathe bed is made from a 16 per cent steel, 1 per cent nickel gray-iron mixture, providing a close grain and long wearing surface. Three angular bearing V's are fitted on the bed, one of the V's providing a rear bearing for the carriage. The apron is of the full double-plate design with all gears of alloy heat-treated steel and all bearings the anti-friction type. The rack pinion gear is mounted on Timken bearings.

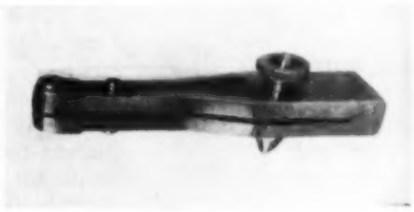
The motor drive arrangement is in the cabinet leg underneath the headstock. Drive from the motor to the main pulley clutch can be had by chain, flat belt or multiple V-belts.

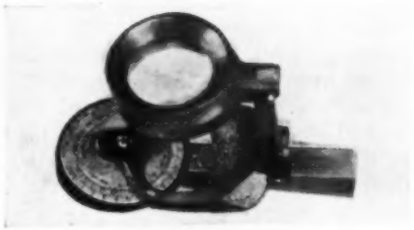


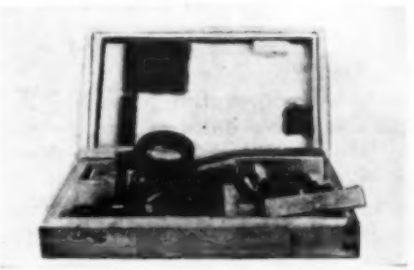
Ferner Dwarf Brinell Press

A portable Brinell hardness testing instrument, suitable for use in any part of the plant where a drill press, arbor press, vise, or a large C clamp is available, has been announced by The R. Y. Ferner Co., Investment Building, Washington, D. C. The instrument consists of a heavy piece of steel about 7¼ in. long, ⅞ in. thick, 1⅝ in. wide at one end and tapering to a width of ¾ in. at the other end. This piece is slit by sawing in the horizontal plane from the smaller end to within about ¾ in. from the larger end to form a heavy two-pronged spring.

On the under side, near the end of the slit, is mounted a holder for the steel ball, which is about 5 mm. in diameter. Opposite this on the upper prong is a knurled knob to which pressure is applied. In making







a test the instrument is held in the drill press or between the jaws of the vise or C clamp with the ball point against the piece to be tested. Pressure is applied for 30 seconds after the full load is reached, the same as in the bench types of Brinell machines. The pressure used, however, is only 750 kg., because of the reduced ball size.

Measurement of the pressure used with the instrument is obtained mainly by a sense of touch. In the lower prong of the press at the small end of the instrument is fastened a

pin about 5/16 in. in diameter, which extends upward through a hole in the upper prong. The upper end of this hole has a flat ring around it, and normally, when no load is applied, the end of the pin is about 1 mm. below the surface of the ring. When pressure is applied, the operator grasps the smaller end in such a way as to hold his thumb or finger over the surface of the ring and when he feels the end of the pin to be flush with the surface of the ring, the full pressure of 750 kg. has been reached. The position of the pin can be judged within 0.01 mm. or 1 per cent of the pressure load.

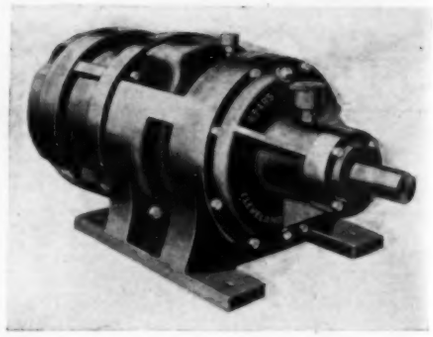
For measurement of the impression an evolute loop, a magnifying glass which is equipped with a cam having a rim with an evolute curve, is supplied. The magnifying glass is mounted on a hinged arm connected to a base having a beveled edge, which serves as a reference mark or index to be placed in contact with one edge of the Brinell impression. The cam is then rotated until its edge makes contact with the opposite edge of the impression. By a scale attached to the cam and a suitable index the operator can read off the diameter of the impression in twentieths of a millimeter and make estimates to hundredths. The dial also shows the Brinell number.

The box contains a standard test piece of steel. A threaded piece, also furnished, has a No. 2 Morse cone which can be attached to the instrument in place of the knurled knob to which pressure is applied. This permits holding the instrument in a drill press. The outfit is supplied in a box 8½ x 5 x 2 in. The weight of the two-pronged steel piece is 2 lb., and the whole outfit weighs only 3 lb. 9 oz. For the softer metals a pressure of 250 kg. is used, and for measuring this pressure a slightly longer pin is used in the lower prong.

Gears & Forgings Planetary-Type Motorized Speed Reducer

A speed reducer of the planetary type built integral with an electric motor to form a compact unit has been placed on the market by Gears & Forgings, Inc., Cleveland, Ohio. This motorized speed reducer is designed particularly for applications where available space for the driving mechanism is limited.

The housing for the reduction gears is dust-proof and oil-tight, and is integral with the base, which extends to the center line of the motor and provides rigid support to the gearing and the output shaft. No additional loads are imposed on the motor shaft, which is supported by two ball bearings. Thirty-four standard ratios are available, ranging from 4:1 to 240:1 inclusive, and sizes range from ¼ to 30 hp.



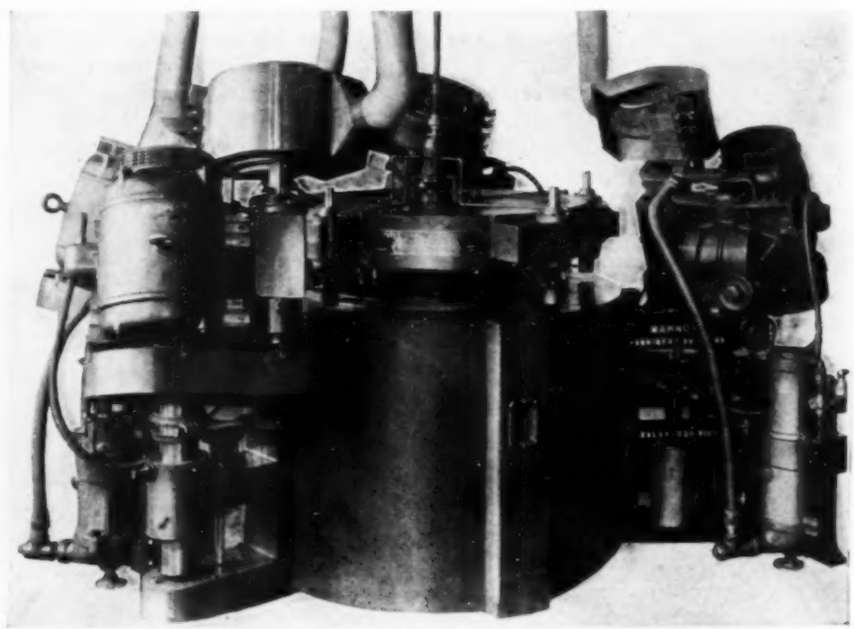
Hammond Universal Rotary Automatic Polishing and Buffing Machine

Flexibility and high output are features of the universal rotary automatic polishing and buffing machine announced by Hammond Machinery Builders, Inc., Kalamazoo, Mich. Whether the work to be polished is round, flat or bevelled, means are incorporated in this machine so that the desired finish may be obtained with simple adapters. The table can be supplied with an indexing, continuous or reciprocating motion, and with a combination of these three. Therefore, the machine is suitable for plants which polish a variety of shapes, and which are often obliged to make comparatively small duplicate runs.

The polishing and buffing heads for this machine are driven units through multi-V belts from individual motors. The speed can be varied either through various sheave diameters or by means of the Hammond variable-speed V-pulley, which permits increasing low speed by 50 per cent. The spindles also have a self-contained oscillating feature, which may be thrown in or out by a lever on the outside of the housing.

The work table is mounted on anti-friction bearings, is dustproof and is indexed by a Geneva motion. The machine is equipped with anti-friction bearings throughout, and the entire base is dust-proof. Safety start and stop buttons are furnished for each individual head, and a master switch is provided at the operator's station.

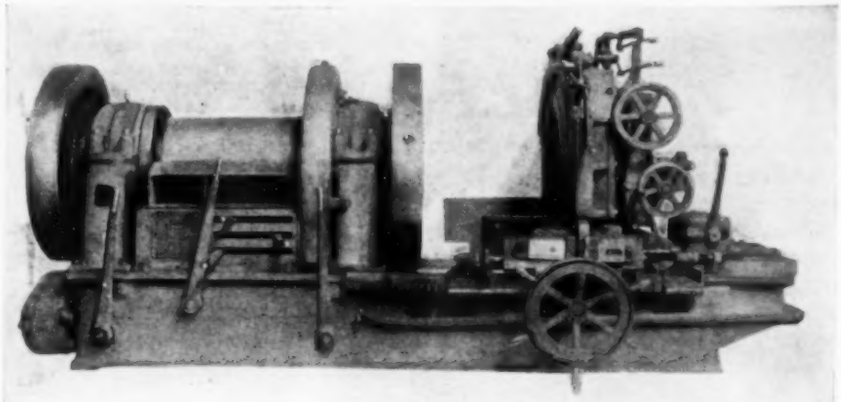
This machine is supplied with automatic composition paste feeders (*AM*—Vol. 75, p. 471). It is operated by means of compressed air and the composition paste is delivered through



Hammond Four-Spindle Universal Rotary Automatic Polishing and Buffing Machine. Six and seven-spindle models are available for higher production

a distributing nozzle to the polishing or buffing wheel Centrifugal force of the wheel carries the composition to a fabric collector pad clamped to one side of the nozzle. The pad contacts with the polishing wheel, applying a definitely controlled film of composition. The proper amount of composition necessary can be fed to the wheel either constantly or intermittently. The nozzle is supplied in sections and can be built up.

Landis 13⅜-In. Pipe Threading and Cutting Machine



Another machine with a receding-chaser diehead and leadscrew has been added to its line of pipe machines by the Landis Machine Co., Inc., Waynesboro, Pa. This 13⅜-in. size has capacity ranging from 4½- to 13⅜-in. O.D. It will generate a tapered pipe thread of any length up to and including 8 in. and any taper of ¾ in. per ft. and less on pipe, casing and tubing within its range.

The receding chaser feature reduces the cutting strain on the chasers to that required for a straight thread of like diameter and pitch, and insures accuracy and good finish. It permits the use of a narrow chaser, which lowers the initial chaser cost approximately 50 per cent.

The diehead has a universal adjustment for size and also a micrometer adjustment for the final setting. The diehead is a two-cut type and can be used for roughing and finishing, both cuts being controlled by the same receding mechanism. The finishing cut can be made without any change in the diametrical adjustment.

Chaser holders for the diehead cover a range from 8⅛ to 13⅜ in., but chaser holder extensions, having a range from 4½ to 8⅝ in., can be fitted to the chaser holders. The same chasers can be used for any pipe size within the ranges of the chaser holders or chaser holder extensions, so long as the pitch, taper and thread form are constant.

Rockwood Improved Short-Center Drive

Several improvements have been made by the Rockwood Mfg. Co., Chicago, Ill., in its short-center drive. The base is now equipped with adjustable arms for the motor, and the drive is now adaptable to all kinds of motors built for 25, 50 or 60 cycles, single or polyphase, a.c. or d.c. This feature of adjustable motor-arm brackets permits minimized wear on the pulley-end motor bearing, and gives means for securing the correct belt tension so that the life of the belt is increased. In addition, the power consumption is only that required by the driven machine.

When the base is shipped, it is assembled so that the motor bracket is directly over the center line of the base, but Fig. 2 shows the bracket displaced so as to move the motor away from the center line. When installed the base is located in position dictated by the desired center distance, and the pivot shaft moved away from the end of the base and the adjustable arms moved one-third of the distance outward away from the pivot shaft. Thus, there is ample room for any movement of the motor to increase or decrease the amount of the motor weight used as belt tension. After the drive has run a while the pulleys can be checked for belt slippage.

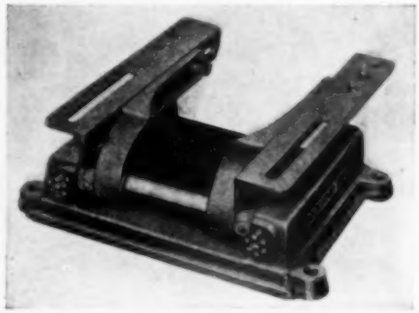


Fig. 1—Adjustable arms permit use of any commercial motor

Should the bearing pressure be too high so that the motor bearings run hot, the motor can be adjusted backward toward the center line of the base so that the bearing pressure is lessened. The list of drives carried in stock has been increased to 100 hp., 1800 r.p.m. Larger bases of special welded steel construction are made to order.

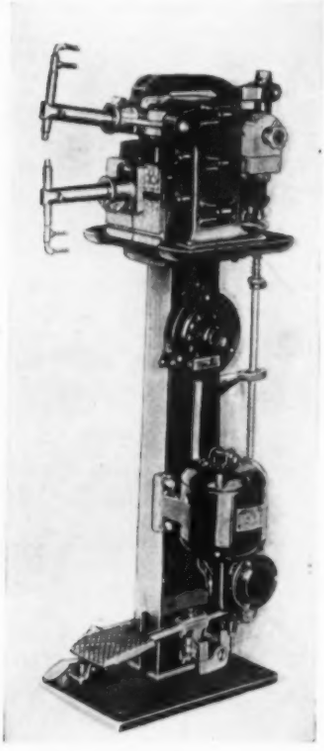
Fig. 2—Motor displaced from centerline of base to increase the belt tension

"Lubriplate" Greases and Oils

Plating a minuted zinc film on bearing surfaces is one of the features of "Lubriplate" oils and greases announced by the Lubriplate Corp., 3114 Chrysler Bldg., 405 Lexington Ave., New York, N. Y. Defects and tool marks in the metal are filled up with the zinc plating, but the plating is not increased to a point where it disturbs the fit. Thus, Lubriplate not only gives a better bearing surface but prevents rust and corrosion. Lubriplate is nearly white in color and is not subject to discoloration with use, it is claimed. It is offered in a full range of oils for light and heavy-duty operation and also greases.

Eisler Series MW Variable-Speed Spot Welders

Series MW variable-speed spot welders, announced by the Eisler Electric Corp., 740-772 So. 13th St., Newark, N. J., are equipped with a variable-speed reduction, geared-head motor enabling the operator to make from 30 to 100 welds per min. in



graduated steps. A variable-current regulator controls the heat of the weld, while the pressure is adjusted by a nut. Timing is automatic and is maintained uniformly at all speeds. The six sizes of machines produced are ½, 1, 3, 5, 10, 20 and 35 kva. and will weld from 0.0005 to ⅝ in. combined thickness. These welders are suitable for use in the manufacture of radio tubes, incandescent lamps, automotive and electrical appliances, metal novelties, and sheet parts.

Allen Chrome-Molybdenum Hollow Screws

Large gains in tensile strength and hardness of its hollow screws have been secured by The Allen Mfg. Co., Hartford, Conn., by the substitution of a chrome-molybdenum steel for the steel formerly employed. The tensile strength of these screws is now 50 per cent greater and the Rockwell hardness has been increased 25 per cent. The screws are available in all sizes commonly used. They are milled from the bar with cut threads. These screws are now in stock with the company's jobbers.

Le Roi "Rix" Supercharged Stationary Air Compressors

A line of stationary air compressors incorporating the Rix patented supercharger principle is being manufactured and marketed by the LeRoi Co., Milwaukee, Wis. The stationary type machine will be available in displacement capacities of 100, 200, 300, 400, 500, 600, 800, 1,000 and 1,200 cu.ft. per minute. With the supercharger principle an efficiency of 85 per cent is reached at 100 lb. per sq.in. pressure.

As shown in Fig. 1, the unit is mounted on a single base with its driving motor. A V-belt drive can be supplied or a direct connected motor is available. If desired, to suit the floor spare, the motor can be mounted alongside the air compressor giving a horizontal, instead of a vertical belt drive. In the unit pictured an automotive radiator core is used for cooling, making a completely self-contained unit, but the compressor can be cooled with circulating water from the main.

Fig. 2 illustrates the supercharger construction in cross-section. On its up stroke, the trunk-type piston draws air into the annular space between the trunk and cylinder wall through an auxiliary suction valve. On the down stroke this air is trapped and compressed into the annular cored space in the cylinder wall between the water jackets. Just before the bottom of the stroke is reached the piston head uncovers a port and allows the compressed air to escape into the upper part of the cylinder where it joins the air sucked into the cylinder in the normal way. In this way the volume of free air handled per stroke is increased 25 per cent and the volumetric efficiency raised proportionately.

In details of construction, the unit follows advanced automotive practice. The balanced crankshaft is forged from S.A.E. 3140 chrome-nickel steel and is heat-treated and ground. Reciprocating forces are kept down through the use of drop-forged duralumin connecting rods and cast duralumin pistons. For the cylinder

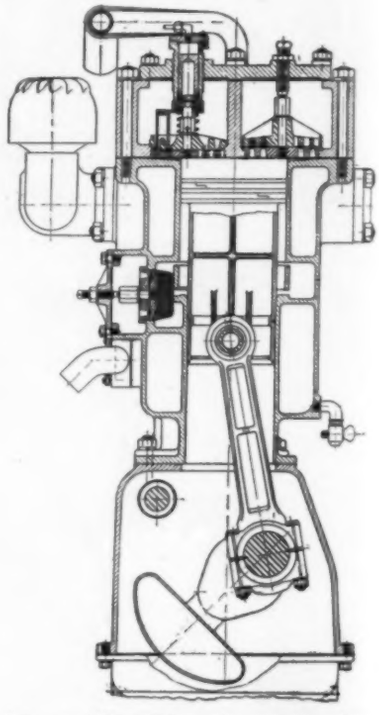


Fig. 2—Illustrating the construction of the trunk piston and integral supercharger

Fig. 1—LeRoi "Rix" Supercharged Stationary Air Compressor with V-Belt drive

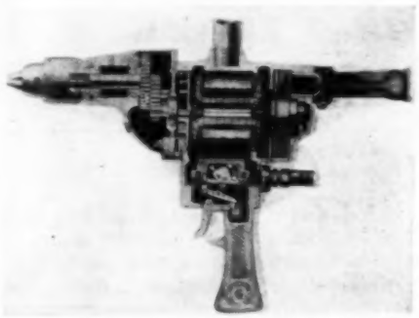
block, an electric-furnace gray iron of high density is used.

Main bearings are bronzed-backed babbitt and connecting rod bearings centrifugally cast babbitt. Forced pressure lubrication through drilled holes in the crankshaft is supplied by a gear pump. Valves are of the plate disk type of alloy steel, hardened and ground. In the illustration over the main suction valve (left) can be seen

an automatic unloader, which opens the suction port when line pressure exceeds a fixed maximum. Centrifugal automotive-type air cleaners are shown, but absorption types are also available.

Stevens-Walden Portable Electric Tools

Portable electric drills, polishers, sanders, valve refacers and bench grinders have been announced by Stevens Walden, Inc., Worcester, Mass. The electric drills are available in seven models—three ¼-in. ball-bearing designs, two ¼-in. Timken bearing designs, and in ⅝ in. heavy-duty and ¾ in. heavy-duty sizes equipped with Timken thrust bear-



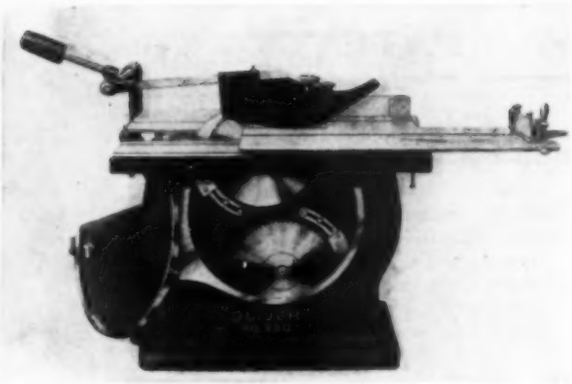
ings. All models have an aluminum body, make-and-break switch, three-jaw chuck, chrome-alloy gears running in a grease-tight case, a universal motor and cable. The ¼-in. drills have load speeds of 2,000 r.p.m., and weights ranging from 4½ to 7 lb. The ½-in. and heavy-duty drills are equipped with Timken double-thrust bearings on the spindle to permit the use of tools requiring reciprocating motion, such as cylinder hones. The load speed of both ½-in. drills is 450 r.p.m.

The portable polishing machines are made in 5, 7, and 9-in. sizes and electric sanders are made in 7 and 9-in. sizes. The bench grinder is made in a 6-in. type equipped with ball bearings and giving 3,450 r.p.m.

Oliver Double-Arbor, Motor-Arbor Saw

Ripping, cross-cutting or mitering can be done without changing saws on this double-arbor, motor-arbor saw. Either a rip saw or cross-cut saw, motor-on-arbor type, may be put into operation instantly by merely turning the handwheel, which swings the yoke carrying the two motor-driven saw arbors. This machine is built by the Oliver Machinery Co., Grand Rapids, Mich.

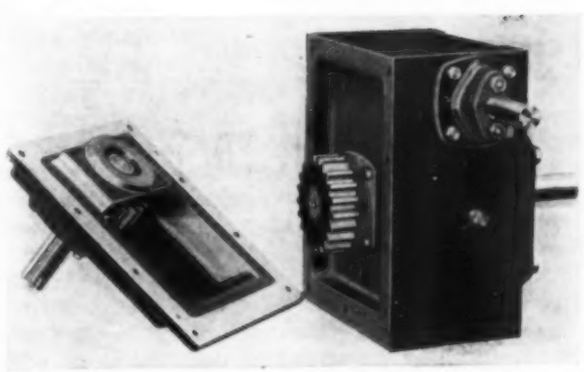
The motor of this machine is built directly on the two ball-bearing saw arbors. It carries a 16 in. rip saw and a 16 in. cross-cut saw. Larger saws can be used one at a time. Dado heads may also be used. The tilting table has a rolling section and universal ripping fence, together with full complements of miter cut-off gages, circular segment gage, guard and other parts for universal saw operation. The machine is thus suitable for pattern shops and model or experimental departments. The table measures 41½ x 44½ in. and tilts 45 deg.



Ohio Two-Speed Reversing Unit

The Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio, has announced a two-speed reversing unit. When this unit is used as a substitute for bevel gear reversing, it permits the clutch to be placed where most convenient, instead of between the two ends of the shafts, where, as a rule, there is little room to spare. The two speeds may be arranged for 1:1 ratio or any other reasonable ratio likely to be met with. Furthermore, the shaft may be arranged to be on opposite sides of the housing or on the same side, and to operate in the same or in opposite directions. All gear teeth are permanently in mesh to avoid undue wear.

The unit can be arranged to operate shafts whose centers are several inches apart. If a Hookes joint or similar device is added it also operates shafts which are out of line as well as out of center. Being completely inclosed, the reversing unit is dust and moisture proof. The ball bearings are grease lubricated.

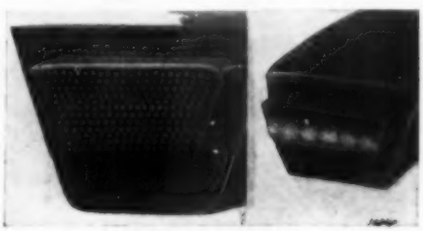


Open view showing rigid construction for shaft bearings and oil passages

"Condor" V-Belt

A V-belt with no inelastic stretch has been developed by The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. This is accomplished by not using the same general construction for all sizes of V-belts. For light-duty, high-speed sizes, a flexible "Whipcord" construction is employed, and for the heavy-duty service a more rugged design known as "Plycord" has been evolved.

Condor Whipcord consists of one layer of continuously wound cords imbedded in two layers of tie-gum. The balance of the belt is filled out with extensible and compressible rubber with a closely-woven rubberized duck cover. Condor Plycord is made up of continuously wound plies of cord with one layer of tie-gum between each. After being built up to the correct thickness, it is cut to the correct angle of the belt, but otherwise is similar to Plycord.



• PATENTS •

DECEMBER 22, 1931

Metal-Working Machinery

Bending Machine. Carl Berges and Wilhelm Berges, Mairenheiden, Germany. Patent 1,837,196.

Intermittently Operating Mechanism. (Rotary Grinder). Warren F. Fraser, Westboro, Mass. Patent 1,837,319.

Work Supporting Mechanism for Grinding Machines. Herbert A. Silven and Albert G. Belden, Worcester, Mass., assigned to Norton Co. Patent 1,837,342.

Electromagnetic Burr Roller (Welded Seam). Frank L. Sessions, Lakewood, Ohio. Patent 1,837,494.

Punching Machine. Medard F. Bollaert, Oakland, Calif. Patent 1,837,522.

Milling Machine Head. John H. Edwardsen, Chicago, Ill. Patent 1,837,766.

Centerless Grinding Machine. Harold W. Holmes, Detroit, Mich., assigned to Cincinnati Grinders Incorporated. Patent 1,837,821.

Hydraulic Pull Bushing for Broaching Machines. Donald H. West, New London, Conn., assigned to The Lapointe Machine Tool Co. Patent 1,837,933.

Apparatus for Forming Sheet Metal Articles. Max Schwaerzer, New York, N. Y., assigned to Max Mirkin, Edgar A. Fitler, and Russell G. Morris. Patent 1,838,061.

Tools and Attachments

Universal Drill Holder. Rudolf William Andreasson, Detroit, Mich. Patent 1,837,392.

Chuck. Benjamin W. Sunde, Long Beach, Calif., assigned to Blackwell & Sunde, Inc. Patent 1,837,688.

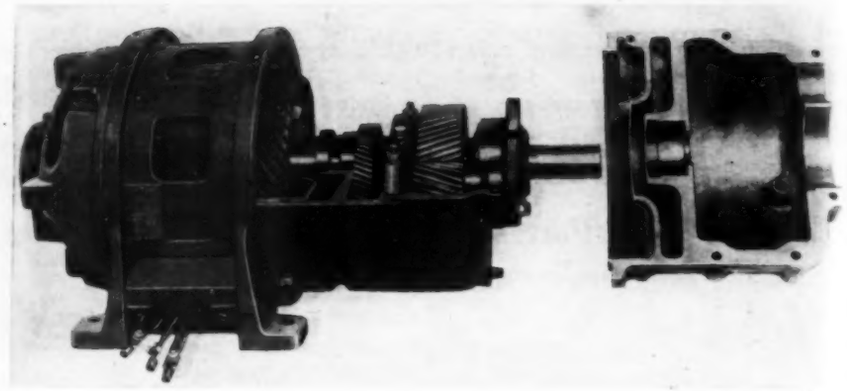
Electric Switch for Magnetic Chucks. Howard E. Tracy, Worcester, Mass., assigned to O. S. Walker Co., Inc. Patent 1,837,693.

Furnaces

Annealing Apparatus. Hermann Von Forster and Emil Lay, Heddernheim, near Frankfort-on-the-Main, Germany, assigned to Aktiengesellschaft Brown Boveri & Cie., Baden, Switzerland, a joint-stock company. Patent 1,838,015.

Westinghouse Gearmotors

A simple, compact and efficient arrangement for powering various motor-driven equipment which operates at reduced motor speeds is afforded by unit drives now available from the Westinghouse Electric & Manufacturing Co., Nuttall Works, Pittsburgh, Pa. These drives, which are known as "Gearmotors," consist of speed reducers combined with motors forming self-contained units



only a few inches longer over all than motors alone. Advantages include economy in space requirements, easy and simplified installation, reduced number of drive parts, high efficiency of operation, and low maintenance.

Each unit includes a Westinghouse Type CS general-purpose induction motor and a double-reduction, nonplanetary type, helical-gear speed reducer built onto the one-piece motor frame, forming a sturdy and rigid assembly which is supported entirely by the motor feet.

An improvement in motor construction incorporated in these unit drives is the pre-wound primary core, which is separable from the stator frame. This feature makes possible economies in motor operation and maintenance, and in repair parts stocks. It also permits quick and inexpensive change of motor speed, voltage, and phase.

The speed-reducing mechanism is fully inclosed in a two-piece housing. The desired reduction of motor speed is obtained by helical gears and pinions, the teeth of which are cut by the hobbing process. Heat-treatment by the BP "tough-hard" process makes this gearing resistant to wear and shock loads. All gear and pinion shafts are supported on roller bearings. By a simple splash system of lubrication, all moving parts of the speed-reducing mechanism and one motor bearing receive a copious supply of oil continuously during operation. The lower section of the housing forms a reservoir for the lubricant. The other motor bearing is packed with grease. Seals on all shafts prevent oil escapement into the motor windings and to the outside of the unit at shaft apertures. Adjoining faces of the two sections of the housings are machined and bolted. No gasket is used.

Gearmotors are built in sizes of ½ to 15 hp. with a wide selection of output ranging from 69 to 1,550 r.p.m. A change in the output of any unit speed can readily be made at a small percentage of the initial cost.

• TRADE PUBLICATIONS •

GEARS. The Continental Diamond Fibre Co., Newark, Del., has issued a catalog on "Celeron Gears," showing the application of these silent gears to many classes of equipment, giving recommended practice, and listing the horsepower ratings and sizes.

MAGNETIC CLUTCH. The Magnetic Mfg. Co., Milwaukee, Wis., has issued Bulletin 50 on the "Sterns" multiple-disk magnetic clutch. The bulletin gives complete technical data of features and characteristics.

SCREW MACHINE. The Triplex Machine Tool Co., 50 Church St., New York, N. Y., has issued Circular No. 536 on the Swiss Beckler universal high-precision automatic screw machine, showing many difficult small jobs done on this machine. Operation of the machine is discussed.

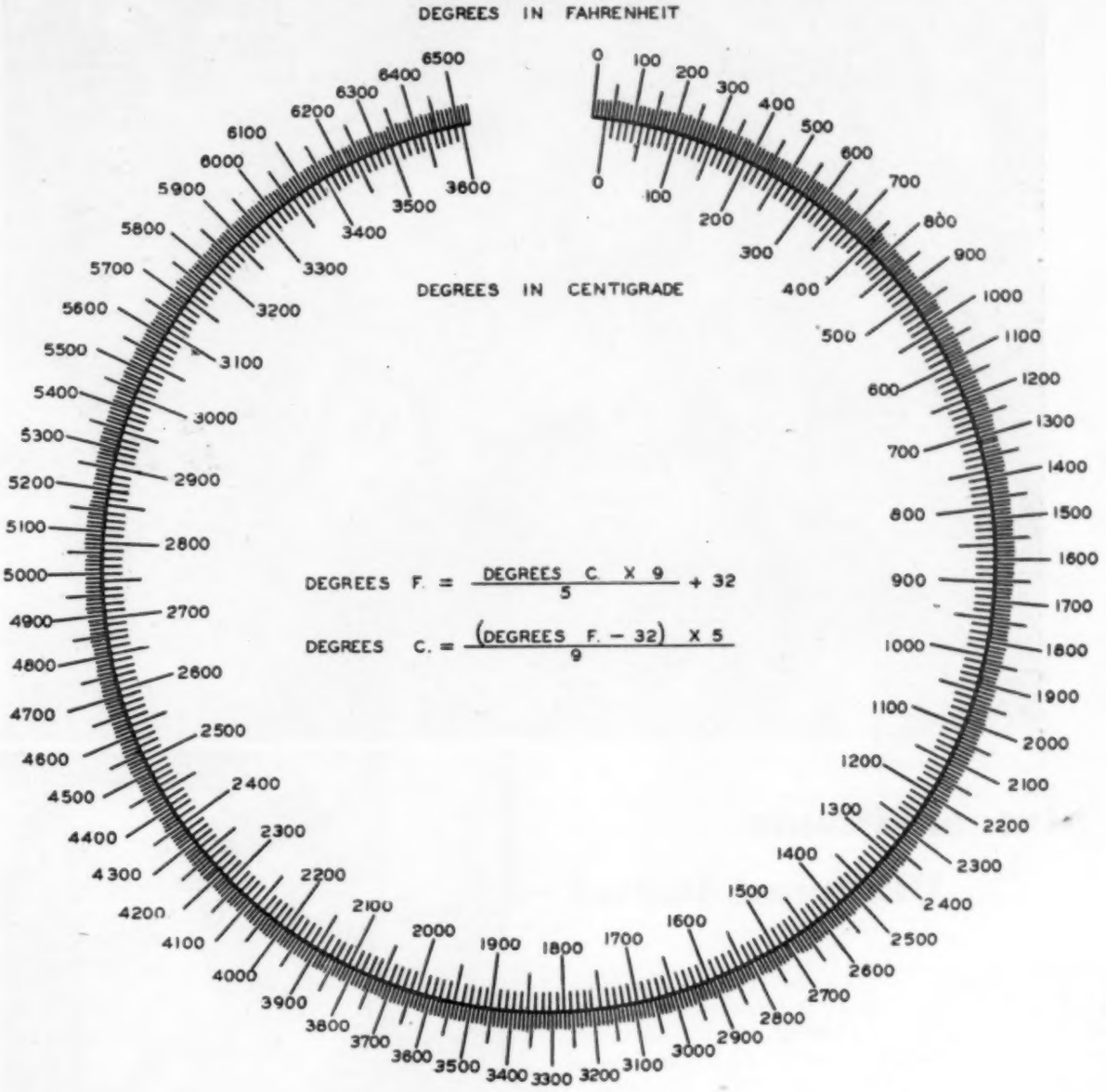
TRADE SHOW DATA. The Policyholders Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has published "How Exhibitors Are Meeting the Trade Show Problem," giving a digest of material from 80 trade associations.

Machining Cast Plastics
Correction

In the reference book sheet under the above title (*AM*—Vol. 75, page 869) bandsaw operating speed was given as "1,300 r.p.m.," obviously incorrect. It should be 1,300 f.p.m., or ft. per min. W. J. Hamilton, who uses these pages in his classes at the Connelley Trade School, caught the error.

American Machinist
Reference Book Sheet

HIGH-TEMPERATURE CONVERSION CHART



CONVERSION TABLE OF EQUIVALENTS

I. Watt hour II. Watt.	B.T.U. B.T.U. per Hour	Calorie* Cal. per Hr.	Horse Power Hour Horse Power	Lb. of Water 1 Deg. C. Lb. of Water 1 Deg. C. per Hr.
1 =	3.417 =	861.1 =	0.00134 =	1.898
0.293 =	1 =	252 =	0.000393 =	60.556
0.001163 =	0.00397 =	1 =	0.00000156 =	0.002205
746 =	2550 =	642000 =	1 =	1417
0.527 =	1.80 =	453.6 =	0.000707 =	1

* Small calorie (Gram Deg. C.)
1 kw-hr. is equivalent to 3417. b.t u.
1 gal. water contains 231 cu. in., 0.1337 cu. ft., weight 8.33 lbs.

1 cu. in. water contains 0.0043 gal., weight 0.036 lb.
1 cu. ft. water contains 7.48 gal., weight 62.4 lbs.

Courtesy Ajax Electrothermic Corporation

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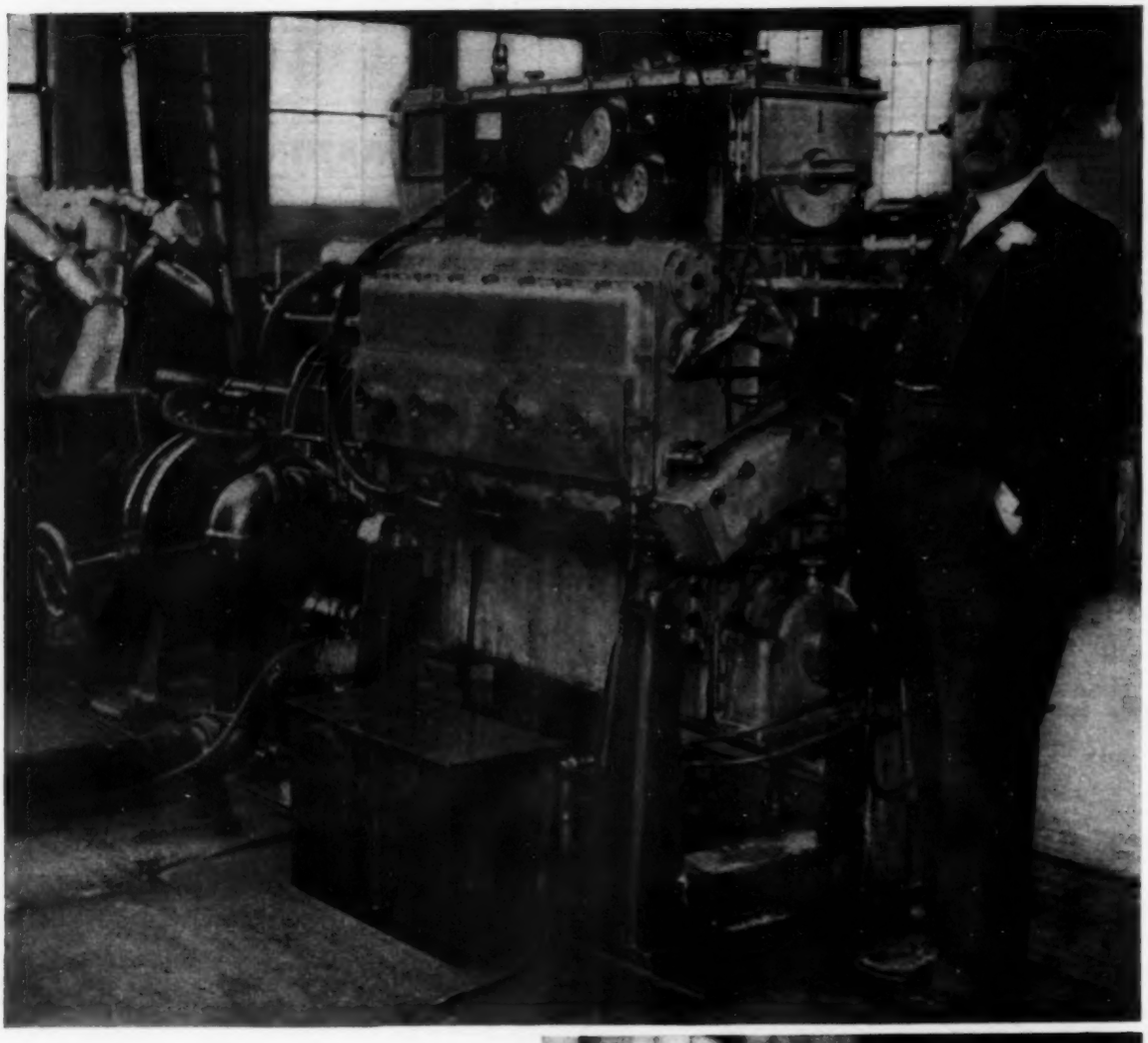

A Sixteen-Piston Diamond Diesel

A DIAMOND-SHAPED Diesel type engine, with eight cylinders carrying sixteen opposed pistons, was demonstrated last week by Frank B. Stearns, Cleveland pioneer in the automobile industry. Viewed by experts of the General Motors Corp., Aluminum Co. of America, International Nickel Co., and other engineers, the engine is declared especially adaptable for airplane, dirigible, truck, or tractor purposes. It weighs 2,000 lb. and develops 175 hp. running at 1,500 r.p.m. Since it is a Diesel it is fueled by direct intake, consuming 0.42 lb. of relatively cheap fuel oil per hp.-hr., as compared with average gasoline engine consumption around 0.6 lb. The engine, built of aluminum and aluminum alloys throughout, except for the crankshaft, is the culmination of twelve years of research costing around $500,000, according to the inventor. It may be the forerunner of a definite trend now manifesting itself towards the use of Diesels for heavy-power, vibrationless service. Mr. Stearns is shown at right with a model of the cylinder and piston arrangement.

EDITORIALS

January 7, 1932

K. H. CONDIT • F. H. COLVIN
Editors

Sanity in Prices

Unless we are greatly mistaken, you have been scanning every piece of mechanical equipment in your plant. You are hard after every possible economy. You have called in machine tool and equipment builders for recommendations. You are considering new machine tools, new fixtures, new small tools, new equipment of various kinds. But somehow the current mania for lower prices has crept into your brain cells. You forget that the tools of 1932 are not those of five years ago. They bear the same old names, it is true, but you know they are beyond comparison in accuracy, rigidity, productivity and value. You somehow feel, rather than reason, that tool and equipment prices ought to come down in proportion to the cuts you have probably been forced to take.

Right here is where you will stub your toe, if you do not watch your step. Figuring production equipment on anything but a basis of productivity —cost per unit of manufactured product—can get you into a peck of trouble. Without new equipment your production costs will throw you out of competition. Unless you are careful you are going to cut off your nose to spite your face.

It should be clear to every executive and operative in the industry that the machine tool and equipment builder stands in very much the same relation to your plant that your family doctor does to you and your family. If your doctor were to fail to advance with his art, allow his instruments to go to pieces, neglect his clinics, cheapen his methods—and possibly cut prices to suit—you would be the first man to rise up in arms.

The conscientious builder is almost identically in the same position. Not for him to trim down his engineering staff; not for him to neglect the advances in his art. He must progress that you and your plant may progress. Though he has taken advantage of every lowered price for material and labor, lowered volume has caused his overhead to soar in inverse proportion and almost geometric progression. His costs are up not down.

The services of the machine tool and equipment builder are like professional services. If he is going to maintain them at highest efficiency, he must be recompensed. He must be permitted a fair profit. If the builder is onto his job, as you are onto your job, he will stand firm. The costs of the professional engineering services you have been accustomed to expect and demand must be covered, or you yourself will be the eventual loser.

Don't let this current mania for lower prices blind you to the fact that some things cannot be lowered in price without crippling their value. It is up to you and every manufacturer in the country to see that a sane price level is maintained on the things you buy and the things you sell.

Push the Reconstruction Finance Corporation Bill

In his latest book, New Roads to Prosperity, Paul Mazur points out that some new scientific development, or industrial product, or war, has led the way out of every previous depression. If we wait long enough, he goes on to say, some such development will turn the tide this time. But how long can we wait? How long can a painfully large section of the population live on the charity of the rest? Isn't it high time to turn our vaunted organizing ability to the overcoming of our difficulties, even as we set out with grim determination to win the War when we could no longer maintain both peace and honor?

In 1917 there was a powerful emotional appeal that served to unite the efforts of rich and poor, native son and foreign born, Democrat and Republican. There is no corresponding stimulus

now, yet the emergency may become even more serious. We must apply today the cooperation of aroused intelligence instead of the fervor of patriotism that stirred the emotions in 1917.

We need an increase in business activity and we need it immediately. The President has proposed three forms of action to revive confidence and consequently credit. The first, a hopeful effort to restore the confidence of the public in the banks, and of the bankers in each other, has fallen short. Even though it has not met expectations it was worth trying. Now we must adopt the second, and adopt it without delay—the Reconstruction Finance Corporation, which must be set up by Congressional action. Patterned along the lines of the signally successful War Finance Corporation it should meet ready acceptance because of the success of its forerunner.

Congress will surely pass the enabling legislation eventually, but it is vitally important to all of us who depend for our livelihood on a revived industry and trade that it be passed quickly. The necessary bill has been introduced. Be sure that your representatives in House and Senate learn without delay how vitally important their immediate action on this legislation is. Prosperity cannot return a day too soon for any one of us.

Volume Seventy-Six

Founded almost fifty-five years ago by Horace B. Miller, *American Machinist* has gone forward continuously under the same name. With this number it begins Volume Seventy-Six. It has been edited by Jackson Bailey, Frank F. Hemenway, Fred J. Miller, Frederick A. Halsey, Leon P. Alford, John H. VanDeventer, and Ethan Viall, in that order.

Headed by Kenneth H. Condit and Fred H. Colvin, the present editorial staff consists of William W. Dodge, managing editor, S. Ashton Hand, Frank J. Oliver, Jr., George S. Brady, H. R. LeGrand, Chester B. Lord, E. J. Tangerman, C. G. Smith and John Haydock, Jr.

• CHIPS •

The last rites for the old year have been most joyfully and completely administered . . . Retail sales are running ahead of production . . . Even the Congress seems disposed to get down to business . . . President Hoover notifies the two Committees on Appropriations that he will welcome Democratic economy programs . . . And if he secures a merger of all overlapping U. S. bureaus, the depression will almost have justified itself . . . The Comptroller of the Currency rules that bonds held by banks shall be evaluated at intrinsic rather than market values . . . Claude E. Potter, Iowa Democrat, succeeds Ezra Brainerd, Jr., as chairman of the I.C.C. . . . Rail wage conference is set for January 14, in Chicago . . . A.F. of L. demands direct Federal aid for the unemployed.

Canadian railway clerks vote to accept arbitration on proposed wage cut . . . and Canada, herself, trims her unfavorable trade balance of 100,000,000 dollars in 1930 to 7,500,000 in 1931 . . . England proposes that the reparations conference be held in Lausanne, January 20 . . . U.S.S.R. opens largest automoble plant in Europe . . . capacity 144,000 cars and trucks annually . . . schedule for the first quarter, 700 . . . Japan takes Chinchow and pledges payment of alien firms for supplies furnished General Chang, deposed governor of Manchuria . . . Eastman Kodak Company purchases the Nagel Camera Works of Stuttgart.

WATCH SOUTH AMERICA

According to Albert Kelsey, technical adviser to the Pan-American Union, certain Latin-American countries seem to be " in revolt against the machine age" and returning to hand labor. Repair parts for certain American machines are being imported from Germany at about one half the cost of genuine American parts.

New freight rates go into effect . . . increases are being handled as surcharges . . . Brunswick-Kroeschell Company is moving its Chicago plant to New Brunswick and Newark, N. J. . . . the sales organization is moving to New Brunswick . . . The New Haven substitutes buses for trains on three branch lines . . . Hudson-Essex of Canada, Ltd., is organized to manufacture cars at Tilbury, Ontario . . . Not to be outdone, Walter Motor Truck Company forms Canadian subsidiary . . . Copper & Brass Research Association estimates that, exclusive of public works, building construction will total 3,420,000,000 dollars in 1932 as against 2,909,000,000 in 1931.

U. S. Air Corps places initial order for twelve Caterpillar tractors . . . four are standard ten-ton units . . . eight are equipped with new type front end cranes . . . And Caterpillar Tractor Company increases its shop force . . . The New York Automobile Show begins day after tomor-

row with dealer stocks lower than in many years . . . Cadillac Canadian sales ran 20 per cent higher in 1931 than in 1930 . . . General Motors Oshawa, Canada, plant recalls 1000 employees . . . White Motor Company orders 13,500,000 pounds of material to manufacture 774 heavy duty trucks for New York City . . . Altorfer Brothers are working overtime on their washing machines with a full crew of 1200 . . . Copeland Products earned $6.04 per share in 1931, against $2.05 in 1930 . . . Ford Motor Company is expected to reach its production peak around February 15.

•

WHERE WAS THE DEMAND?

The Jarman Shoe Company increased its sales 23 per cent in 1930 and did still more business in 1931. The following is a sales letter sent out by this company—

"Next time a big thinker solemnly tells you that we are having a depression because the law of supply and demand was violated, ask him what he means by demand. Or, ask him to go chase a fish.

"Where was the demand for radio 10 years ago? . . . Where was the demand for eight-cylinder cars when only four-cylinder cars were built? "Where was the demand for Frigidaires 10 years ago? And oil furnaces?

"The way for a manufacturer to cure depression is to make a better product and tell the public about it. Demand is flexible. No one demanded our shoes seven years ago. Today 2,000,000 people demand them. Tomorrow it can be two and a half million.

"Drop me a line when the depression is over. I might be too busy to notice it."

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THIS WEEK IN *AM*

For more years than one would care to count, we have had cold rolled shafting. More recently we have had rolled screw threads. But it would seem that cold rolling has been applied to a greater diversity of uses in England than in America. For that reason we asked James R. Cornelius, machine designer of Coventry, England, to write us a thorough-going review of the art as it is practiced in his country. It appears on page 2 under the title, "Metal Rolling in Mass Production." We would suggest that operators of small shops who pass the article by on account of its title will be missing several bets.

"How Much Economics?" (page 8) is the Foreman's Round Table of the week. Let us have your best thought for publication. In "Nickel-Chromium Cast Iron Dies" (page 11) you will find a complete table of the various alloys and their applications to the various types of die service. You will be bound to agree that Herbert Chase has again rung the bell.

Though Francis W. Shaw's contribution for this week is a discussion (page 15) on a previous article "Machining Allowances on Forgings," you will find much original material of practical value. You might like to pass it along to your purchasing department.

Those same twin carbides, tungsten and tantalum, are going to be called upon more and more as the new year gets under way. Rightly handled they are wonderful, and J. M. Highducheck, Westinghouse Electric & Mfg. Company, shoots right from the shoulder as he tells "How to Make Carbide Tools Pay (page 16).

The Reference Book Sheet (page 33) presents the handiest Fahrenheit-Centigrade conversion table we have seen. Over the page, you will find the latest news and pictures on Stearns' eight-cylinder, sixteen-piston Diesel.

• COMING •

Some time back our Berlin correspondent asked us whether our readers would be interested in a 56-ton apparatus for accomplishing various operations on locomotives at one setting. We felt that we were not taking too great liberties when we said that practically every reader would like to know about it. His article will appear next week without fail. Though you may never have set foot into a railroad shop, you may find a chance to adapt the underlying ideas of this big machine to other work.

Have you by any chance thought of the comparative industrial peace prevailing in this country right through this disheartening depression? One man feels that the workman himself should receive due credit for his cooperative attitude and his patience. His tribute will also appear next week. Further high spots will be: a list of recommendations for applying gearing; data on how to avoid spots on enameled sheet metal work; cutting fluids and their application; broaching elongated slots. The Reference Book Sheet will be made up of one of the best cutting fluid tables yet assembled.

January 21 is the day and the date for the *American Machinist* Semi-Annual Shop Equipment Review. 363 American items and 107 European items will be included.

Progress in Metal-Working and Machinery Markets

SMALL SALES, occasional inquiries, and one or two lists gave tool builders and dealers something to think about over the holidays . . . All districts watch New York and this week's automobile show as some indication of what 1932 auto sales will be . . . Upon these sales depend general sales, upon general sales depend matefrial, part and accessory sales, and on the group depend tool sales—or at least the needed impetus to tool sales . . . International Harvester and General Electric have each released a 25-tool inquiry.

NEW YORK dealers were cheered by G.E.'s inquiry for the Springfield repair shop, even though the tools will be sold through Schenectady . . . There is also some Government and municipal business, usually single small tools . . . Detroit expects Ford's 8-cyl. job to be in production before the middle of the month, with peak production by Feb. 15 . . . Tool sales are expected to follow a similar curve, as is general business . . . Cincinnati, selling an occasional special tool to automotive sources, has as principal buyers general machinists and miscellaneous users taking single replacement items . . . New England's prospect list is bigger, present inquiries looking potent, though sales are isolated single replacement items thus far.

CHICAGO, with many inquiries on file, predicts an upturn early this year . . . The prize exhibit there is a 25- small-tool inquiry from International Harvester . . . Canadian business appears favorable and metal-working plants are stepping up activity, although tool sales are unexceptional . . . Los Angeles has hope, but sales still drag . . . Indianapolis feels better and has better inquiries . . . Southern District is unchanged.

NEW YORK

Usual year-end quiet prevailed last week, although a warm glow around the cockles of many a dealer's heart resulted from the General Electric 24-tool inquiry for the Springfield (Mass.) repair shop. Some metal-working, some wood-working, and a number of small general repair tools are included. Most dealers did not come in to their offices Saturday, but one who did spent all day submitting bids and doing other cheerful work on Government and municipal inquiries. January is expected to be better than December, which in some cases is saying a good deal, in others not so much.

DETROIT

The year-end found the machinery and machine tool trade at low ebb, with attention shifted for the moment to the opening of the automobile show in New York. Orders dropped to the vanishing point in the last week of the year and production likewise hit bottom, but the trade looked to the first quarter to witness an upturn equalling if not exceeding that of 1931. Assurance that Ford would be in production with a new eight-cylinder car before Jan. 15 has reacted favorably and was further borne out by statements of a Ford official that the employment peak would be reached at Ford plants Feb. 15. Machinery and tool plants and dealers all look for business to follow the upward curve of Ford production at least until the latter part of March.

CINCINNATI

Machine tool manufacturers and selling agents start the new year with a small volume of orders and a fair number of inquiries. There is a feeling that there will be some market improvement after inventory and budgeting periods have passed. A few orders for special tools have been received from the automobile field, but principal buyers are general machinists and miscellaneous users, whose needs in the main are single tools for replacement.

NEW ENGLAND

Machine tool builders enter a new year with a better volume of prospects listed. Sales of the week were unimportant, confined to machines for replacements in scattered sections. Locke Steel Chain Co., Bridgeport, is working on an order for 1,000 power lawn mowers, totaling nearly $600,000 and assuring working schedules until July. Inquiries are in substantial volume and representative of a better variation of industries. Of chief importance are expectations from the automotive industry.

CHICAGO

A feeling of relief that the end of 1931 is in sight pervades the tool industry. From what can be gathered, the year has been one of the most depressed periods since 1912-13. What the new year may bring forth is purely speculative, but a preponderance of opinion is that early in 1932 there will be an upturn. This is predicated on the large number of inquiries on file, many dating back several months. The automobile industry continues to afford hope. A local representative of a Mid-West manufacturer of small tools exhibited several orders received last week, one, listing 25 items, being from International Harvester Co.

CANADA

Increasing optimism in industrial and commercial life and a general spirit of confidence, engendered by many favorable economic signs, is the situation in Canada as a new year begins. The trend of manufacturing is favorable to an early pick-up in the metal-working industry generally. Operations of steel fabrication plants have increased. Electricity consumption in industry is on the increase; hardware jobbers report better buying among dealers.

LOS ANGELES

Closing of the year presents no new features in machine tool and general shop supply lines. Major lines of metal product manufacture show no change toward a return to normal in the near future. In fact there has been little change of any kind during the past several months. Still, there is general hope looking towards possible improvement after the first of the year.

INDIANAPOLIS

A few inquiries thus far have led to little business; little change is seen otherwise, though the new year brings better feeling. Some metal plants are putting out feelers and are expecting a fair volume of business during the first quarter. Plans now call for increased automobile production. Sales of small equipment continue to radio and mechanical refrigerating companies. Production in farm implement factories is getting under way slowly, but some small equipment has been purchased. Some small tools are being sold to machine shops and to airports.

SOUTHERN DISTRICT

Little tool activity was reported the past fortnight. Small orders from scattered sources made up the sales, and small tool business was the rule. Prices in the used machinery line are not quite as satisfactory as might be. Shipyards and railroads throughout the Southern area have practically been suspended from the buying register of jobbers and manufacturers. And since little industrial expansion has been reported, and the oil fields have developed a stagnancy quite unbelievable, there is little else to look forward to. With the advent of a new year and new enthusiasm, however, high hopes are held.

WEEK BY WEEK

The Business Barometer

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

BROOKLYN Public Library reports the demand for cook books and books on home making has recently shown a phenomenal gain and that it continues to grow. The apparent increase in the distribution of low-priced shoes is another item which has already been extensively commented upon. Still another is an announcement by Dr. Julius Klein, assistant secretary of the Department of Commerce, that 1,400 department stores report a decrease of 19 per cent as compared with last year in the value of their sales for the first 23 days of December. But making allowance for the decline in prices, this decrease in money value involves a reduction of only 5 per cent in volume. Some New York department stores show an increase in sales.

These and other seemingly unimportant items are straws which show the direction that the current of business has taken, and they are really more significant than many realize. Business, industry and finance are now so interwoven that it is difficult to measure the strain that each thread in the fabric has to bear, and a reliable interpretation of current developments is for this reason very difficult.

In some quarters there is a noticeable improvement in the temper and activities of merchants and manufacturers. In others the feeling of pessimism still beclouds the sunshine of prosperity. But the clouds are not as black as they were, and the sunshine is to be seen much more frequently than during the dark months of last summer.

Farm Unit Sales Up

Wood Netherland is President of the Federal Land Bank of St. Louis. In an address that he made on Dec. 18 before a meeting of the Agricultural Club of the St. Louis Chamber of Commerce, he said that the year 1931 would show an increase of 314 per cent over 1930 in the sale of small self-contained farm units. He explained that these farms were purchased by people who once lived on the farm, city business men, or foreigners who have been employed in industrial areas and knew nothing but farming before coming to the city. He added that if we had good crops, the year 1932 would probably be one of the biggest pay-off years we have ever had.

Meanwhile, sympathy with the financial predicament of the railroads is increasing, and it now seems possible that some further increase in rates as well as a decrease in wages will be authorized by the various parties in interest, including the labor unions and the Interstate Commerce Commission.

But these items, encouraging as they are, do not fully offset the depressing influence exerted by the number of bank failures that have been reported from day to day. This financial weakness is difficult to explain. Banks in almost every section of the country are shutting down and asking their depositors to be content with reassuring statements which encourage the hope of an early resumption of business. Thus far nearly 2,100 of these suspensions have been reported for the year 1931.

Bank Failures Bad

Were it not for the fearsome feeling that these numerous bank suspensions have engendered we should already be on the way to a substantially higher price level, and a distinct improvement in trade.

This is said despite the rather pessimistic dispatches from Europe that are published in the metropolitan dailies. None of us are mind-readers, and it is, of course, impossible for us to fully understand each other. There are, however, many who have come to the conclusion that Europe is consciously or unconsciously preparing for a shift in the scenery that will put the reparation question backstage and leave it in a position where it will be less irritating to the generations yet unborn upon whose shoulders the burden of the debt claims must ultimately rest.

No one knows what the international alignment will be sixty years from now, and philosophic economists all over the world realize that the situation may be profoundly changed by the developments of the years to come.

To arrive at any workable plan for an immediate adjustment of the claims now insisted upon would be impossible, but time has a very mellowing influence and every year's delay in arriving at a settlement brings us nearer the time when the animosities begotten of the war will have disappeared, and men will be more disposed to agree with Tennyson that "a parliament of man and a federation of the world" are not unattainable ideals.

The growth of optimism is in a measure due to this revival of idealism. The two qualities have much in common, and as confidence returns business is sure to improve.

Few expect serious fighting in Asia, and the economic problems involved in rehabilitation of Manchuria seem to be more important than the military news.

In this country the stock market is commencing to show a little more backbone, and the number of bargain hunters who are to be seen in and around Wall Street is increasing from day to day. Some of the commodity markets are better. The money market is distinctly firmer.

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THE BUSINESS WEEK

January 6, 1932

Business begins another year in the uncertain atmosphere of several unresolved issues which still obscure the outlook. . . . The difficulties of the domestic banking situation, the political complexities of the war debt and reparations problems, the critical condition of railroad credit, and the fiscal difficulties of the federal government are the outstanding obstacles to basic business revival because it is hard to see at the moment how, or how soon, they will be settled. . . . But it is clear that decisive action on each of them is under way, and that by the second quarter of the year the news—good or bad—about all of them will be out. . . . The disturbing uncertainties that are delaying business planning will be behind us, and we shall know what to expect in all of them. . . . When the news is out we shall be sure that, so far as this country is concerned, there isn't any more to come, and the way will be cleared for recovery. . . . It is reasonable to expect that the security markets and the basic industries will respond promptly to the clarification of the outlook, whether it indicates that rigorous readjustment is necessary or that resumed expansion is possible. . . . Our reading of the underlying conditions and tendencies in the domestic situation is that during 1932 deflation will be checked and further drastic readjustment avoided, and that the process of industrial expansion that has persisted in this country almost continuously for a century or more will be resumed until, in three or four years, industrial activity will rise to a new peak and the doubts and difficulties of the present be forgotten.

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MATERIAL TRENDS AND PRICES

The automotive, building and railroad industries seem no more certain of prospective demands for materials in the forthcoming year, than do the lesser consumers of metal products. At any rate, there is noticeable absence of false hopes with regard to the market. Freight rate increases, effective this week, have had negligible effect on prices to consumers. In fact, the new year began without important changes having taken place in the price structure. *(All prices as of Jan. 2, 1932)*

IRON AND STEEL

	Current	Mo. Ago	Yr. Ago
Pig Iron —			
Birmingham, No. 2, Fdry., per gross ton	$11.00	$11.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	15.00	15.00	17.50
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	12.50
Furnace Coke — Connellsville, per net ton	2.25	2.35	2.40
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes — Pittsburgh, base, per 100 lb.	1.50	1.50@1.60	1.60

Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago 4.62½	Cleveland 4.50	New York 4.75
Cincinnati 4.35	Detroit 4.00	

Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	3.75	4.00

Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches					
		½	⅝	¾	1	1¼	1½
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

Stainless Steel — Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb.:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots 73-10-10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn.	7.25
Copper wire, base, Chicago and Cleveland	9.37½
Copper wire, base, N. Y.	9.25
Lead, pigs, E. St. Louis	3.55
Tin, Straits, pigs, spot, N. Y.	21.75
Zinc, slabs, E. St. Louis	3.15
Prices following are in cents per lb., base, N. Y., Chi. and Cleve.:	
Brass rods, high	11.00
Brass sheets, high	13.25
Brass tubing, high	16.50
Copper, drawn round	13.87½
Copper sheets	16.37½
Copper tubing	15.87½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	17.12½
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.75	2.50	2.75
Light brass	2.25	1.75	2.25
No. 1 rod-brass turnings	3.00	2.75	2.50
Heavy copper	5.25	4.25	4.00
Light copper	4.25	3.75	3.50

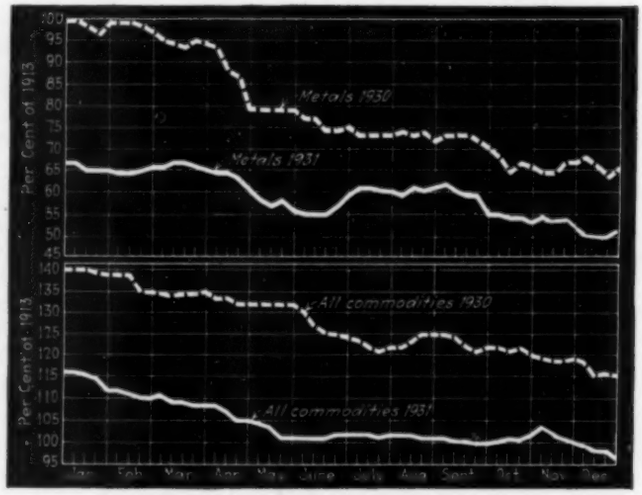
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30-10%	40%	40%
Belting, rubber, trans., Grade 1	60-10-10%	60-10%	60%

Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:
1x4-in. $27.00 1x6-in. $26.00

Skids—Spruce:
2x4-in. $35.00 3x4-in. $35.00 4x6-in. $37.00 6x6-in. $50.00


Per Cent of 1913
Metals 1930
Metals 1931
All commodities 1930
All commodities 1931
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

Tablet Honoring Founder Unveiled at Gleason Plant

Ceremonies recall struggles of Wm. Gleason—Old-time employees, 20-year service men, friends and business associates assemble to honor his memory

Rochester, N. Y., Dec. 29—Old-time employees, 20-year service men, business associates and the present management of the Gleason Works gathered here tonight to pay tribute to the memory of the deceased founder and first president of the concern, WILLIAM GLEASON. The occasion was the unveiling of a bronze tablet containing a portrait bust of Mr. Gleason, placed in the entrance lobby.

GEORGE HUNTER, oldest living employee of the company, unveiled the tablet. He began work for the company in 1880 and worked for it continuously until his retirement in 1924, after 44 years' service. ELEANOR GLEASON, daughter of the founder, read a brief biographical sketch of her father before the unveiling.

Mr. Gleason, born in Tipperary County, Ireland in 1836, came to Kingston, Canada, with his mother when 13. Two years later he moved to Rochester, finding work on a farm. Shortly afterward, he went to work for ASA R. SWIFT as a night helper in Swift's machine shop. One night an engine rocker pin failed, stopping the engine. Young Gleason immediately set to work turning up a new one. He was successful, and was allowed to begin his machinist apprenticeship on the day force. He finished his apprenticeship at I. Angell's & Sons machine shop, was married shortly afterward, and moved to Hartford, Conn. During the Civil War he worked at Colt's Armory.

Founds Own Business

In 1865, Mr. Gleason returned to Rochester and started a small machine shop for the making of tools. Shortly afterward he formed a partnership with JOHN CONNELL and JAMES S. GRAHAM, making machines, tools and woodworking equipment. In 1873, this partnership was dissolved, and Mr. Gleason went with the Kidd Iron Works, where he invented his first bevel gear cutting machine.

Mr. Gleason's bevel gear planer proved successful. The Kidd Iron Works would not, however, finance the enterprise, so he had to build his first machine with his own money. In 1875, Mr. Gleason purchased the works, patented the bevel gear planer in 1876, and began its manufacture, eventually discontinuing the other lines of machine tool manufacture to concentrate on development of this type of equipment.

In 1889, fire gutted the plant, destroying all drawings and patterns and wrecking the machinery. Mr. Gleason was then over 50. His sons, present heads of the company, were then students at Cornell. Receiving a wire from their mother, they went immediately to the plant, where they found their father gloomily watching the ruins. Angered by their unannounced return from school, he sent them back, the incident serving to arouse him from his lethargy. Immediately he began rebuilding of the plant, redesigning his entire line.

The first unit of the present plant was built in 1910. Today the plant covers 22 acres and manufactures perhaps 80 per cent of the bevel gear cutting machinery of the world. With one small exception, all American passenger automobiles have in them gears cut on Gleason machines.

A Master Craftsman

Mr. Gleason was active until shortly before his death in 1922, but in his latter years confined his duties to an advisory capacity. Those who knew him say that his character is well summed up by the inscription on the tablet, "A master craftsman, endowed with indomitable will, a spirit of independence, and broad vision, who created a new type of machine tool and founded this business on ideas of service and fair dealing."

After the unveiling, there was a dinner in the plant restaurant for employees and guests. HENRY MORGAN, president of Morgan Machine Co., and JEREMIAH HICKEY, president of Hickey-Freeman Co., made short addresses, recalling memories of Mr. Gleason.

While the dinner was intended only to honor the founder, present employees of the concern found it an opportunity to show their esteem for the present management also. On behalf of the present employees, Schuyler H. Earl, works manager, presented JAMES E. GLEASON, president, and ANDREW C. GLEASON, vice-president and treasurer, a bronze replica of the tablet unveiled to their father but containing a suitable expression of esteem present employees hold for their present officers, "faithfully adhering to the ideals of the founder." The presentation of this memorial and token of affection was a surprise ceremony, reserved by the employees until the regular program of the evening had been completed.

Unemployment Committee Recommends Further Study

The Committee on Technological Employment, appointed by the Secretary of Labor, has recently submitted a unanimous report in which it lays great emphasis on the need for studies regarding technological changes and their effect upon employment of displaced workers. According to the Committee, the Department of Labor should organize and direct studies by the Department and in cooperation with other governmental and private agencies which will produce the information with which to answer these and similar fundamental questions:

a. Is technical change increasing or decreasing the amount of skill required before and after a technical change has taken place?

b. Does technological change primarily affect skilled or unskilled labor or both?

c. What new occupations have come into being because of technical change and have the number of workers securing employment by virtue of these new occupations been more or less than the number of workers who have lost employment by the disappearance of old occupations?

d. What effect has technical change had upon the relative number of men and women employed?

e. What opportunities in kind and number have resulted from technological change?

f. To what degree has acquired skill and experience been usefully utilized in new occupations arising from technical change?

g. To what extent have workers shifted from productive to service industries?

h. To what extent have the increases in new occupations, both in old and new industries or services, increased the labor market?

NEWLY ELECTED OFFICERS OF THE INTERNATIONAL ACETYLENE ASSOCIATION

Left to Right, H. F. Reinhard, secretary; E. J. Hayden, vice-president; W. C. Keeley, Jr., president; W. D. Flannery, retiring president; and W. C. Cotter, treasurer.

Canadian Tool Imports Come Largely from U. S.

In the 12-months' period ending March 31, 1930, total imports of industrial machinery into Canada were valued at $69,117,528 as compared with $32,631,667 in 1926, but for the same period ending in 1931 this figure dropped to $44,207,262. The leading source of supply is the United States, which furnished $62,692,524 worth of this type of equipment in 1929-30, $27,177,066 in 1925-26, and $39,330,468 in 1930-31. The United Kingdom ranks second in this trade, its share amounting to $4,556,727 in 1929-30, $4,291,130 in 1925-26, and $3,772,818 in 1930-31.

Metal-Working Plants Step Up Production

Officials of the Warner Gear Co., Muncie, Ind., have announced that new contracts would result in steady employment for the men who formerly have worked for the company and now are idle. It was said that the new plant probably would be reopened.

As a result of new orders for bumpers, metal tire covers, etc., Federal Pressed Steel Co., Milwaukee, Wis., has increased its shop payroll more than 100 per cent in the last 30 days and is operating 6½ days a week, with two departments maintaining a night shift.

Two departments of Mid-States Steel & Wire Co. have been placed in operation at Crawfordsville, Ind., as the result of several orders received recently. For some time the plant has been operating on about half time. Officials expect further increases in production during the first quarter of 1932.

Operations at plants of the Delco-Remy Corp., Anderson, Ind., a division of General Motors, will continue steady in January, with production practically the same as in December, according to F. C. KROGER, president and general manager. In December employees had more hours than in November. While no additional employees will be needed in January, each present employee will have more working hours to his credit.

Muncie (Ind.) Foundry & Machine Co., has increased its working time to four days a week, according to W. C. SAMPSON, secretary and treasurer. The plant for some months has been operating only one and two days a week.

More than $2,000,000 worth of materials for estimated production during the first quarter of 1932 were let to Indiana manufacturers by Auburn Automobile Co. during the second week in December. The largest single order involved more than $1,000,000 and was placed with Central Mfg. Co., Connersville, Ind. The Anderson plant of Delco-Remy Corp. was awarded a contract for approximately $300,000. Other orders exceeding $150,000 were given Bendix Brake Co. and Bendix-Stromberg Co., both of South Bend. Ross Gear & Tool Co., Lafayette, was given an $85,000 contract.

Free-Machining Patent Awarded Carpenter Steel

A patent covering the general use of abnormally high sulphur to provide free-machining properties in stainless steels has been granted Carpenter Steel Co., Reading, Pa. The broadest claim reads:

"1—As a composition of matter, a corrosion-resisting alloy steel containing essentially between 7 per cent and 30 per cent of chromium, and between 0.15 per cent and 1.80 per cent of sulphur, and characterized by anti-friction quality."

Since this application has been in the office for nearly four years, during which stainless steel has advanced so rapidly, it is somewhat difficult to picture conditions as they were prior to 1928. Although stainless steel was first manufactured commercially in this country as early as 1917 and there were dozens of different analyses by 1928, development of the product has been seriously retarded because it could not be commercially machined. The problem became so serious that during 1926 and 1927 several of the large manufacturers of twist drills, taps and dies did experimental work on specially designed tools. Introduction of the high-sulphur free-machining stainless steels, however, obviated the need.

Schedule March 7-20 for Lyons International Fair

The complete cycle of French production from raw material to finished product, displayed with all machinery employed in the various processes of transformation, will be combined at the next Lyons International Fair, March 7 to 20. Some 3,500 French and foreign manufacturers, including those of 24 foreign countries, will have exhibits, including 625 stands displaying metallurgical products, machinery, tools, engines, motors, hardware, and industrial equipment; and 265 displaying electrical equipment, wireless telegraphy installations, and similar units. L. G. TOUSSAINT, Holborn Viaduct House, Holborn Viaduct 12, London, E.C. 1, England, is official delegate for Great Britain.

The Nickel Industry in 1931

ROBERT C. STANLEY

President, The International Nickel Co. of Canada, Ltd.

Although the nickel industry has shared with industry the world over the disappointments caused by the delay in business recovery, developments during the past year indicate a continuing growth of diversity in uses, which will be more generally appreciated as industry steadily works its way back to normal volume. . . . To the extent that the various non-ferrous metal industries have moved towards putting their houses in order, the companies affected are in better shape both to carry on under depressed conditions and to serve more intelligently and efficiently the needs of a world slowly recovering its consumer vitality.

The industrial world has finally learned during the year 1931 that prosperity cannot be conjured back by pronouncements. We have been taught that salvation lies in increased plant efficiency, in greater marketing ability and in a better understanding that certain situations transcend the capacity of single companies and become problems with which industries as a whole must cope. The further lesson has been given us that the maintenance of prosperity depends on self-discipline in good times.

Keller Die Work Continued By Mechanical Die & Tool

As announced previously (*AM*—Oct. 15, 1931), Keller Mechanical Engineering Corp., Brooklyn, N. Y., was purchased by Pratt & Whitney Co. and moved to Hartford where it is now Keller Division of Pratt & Whitney Co. Part of the Brooklyn activity of the former company was the jobbing die business, but in the reorganization it was decided to omit this line of work.

Mechanical Die & Tool Co., a division of Insulation Mfg. Co., Inc., 11-19 New York Ave., Brooklyn, N. Y., has taken over this work, and will continue to do a general contract tool, die and mold business at the former Keller address, 70 Washington St., Brooklyn. A number of the former personnel of the Keller die department are associated.

Packaging Technique

A two-day clinic on packaging technique and a day's discussion of consumer marketing will be followed by two days devoted to the problems of packing and shipping and a day's program on the subject of production management at the Second Packaging, Packing and Shipping Exposition and Conference to be held at the Palmer House, Chicago, March 7-12, 1932, under the auspices of the A.M.A.

Four papers will be presented at the morning and afternoon sessions March 11 on long-time production planning, the topic for that day being, "Five-Year Planning for Production Management."

Definite arrangements have been completed for the following papers and speakers on packaging technique:

"Packages from the Consumer Point of View," KATHERINE FISHER, director, Good Housekeeping Institute: "What is an Effective Package?" BEN NASH, product development engineering and merchandising counselor; "Color and Design in Packaging," ARTHUR ALLEN, color engineer, New York City; "Packaging Research. An Analysis of New Trends in Packages and their Effects on Sales." Speaker to be announced: "Experience of Companies in Re-Styling Packages." Speaker to be announced.

For the conferences on packing and shipping, two speakers and their subjects are announced as follows: "What are the Minimum Requirements of Containers?" C. A. PLASKETT, in charge of container investigation, U. S. Department of Agriculture, Forest Products Laboratory, Madison, Wis.; "New Transportation Developments and Their Effect on Packing and Shipping," LEWIS SORRELL, professor of transportation, University of Chicago.

Other papers to be included in the packaging and shipping sessions the authors of which will be announced later are: "Manufacturing Problems Connected with Packaging. Operations Involved in Assembling and Filling the Container, Packaging Costs, etc."; "Economic Significance of Packaging and Shipping. Possible Economies"; "Organizing to Cope with Packing and Shipping"; "Materials of Packing and Shipping"; "To What Extent and Under What Circumstances Should the Shipping Container Carry Advertising," and "Unit Packing of Shipping Containers."

More Sales, Lower Cost, N. E. Business Objective

More sales at lower cost per unit of sale is emphasized by New England manufacturers as their major business objective in 1932, according to returns of the first 386 ballots received from New England manufacturers by the New England Council in a poll.

The "ballot" calls for expressions of opinion under three general headings, first, "Measures on which our company will rely for improved profits in 1932;" second "Planning for the Future;" and, third, "Business Progress."

In the tabulation below, the figures represent the number of manufacturers citing each measure.

Measures to be relied upon for improved profits are:

In Selling: Reducing expenses other than salaries or wages, 281; increasing volume of sales, 250; new products, 198; concentration on most profitable lines of products, 163; application of sales analyses to domestic markets, 157; concentration on most profitable customer accounts, 137; new uses for present products, 119; concentration on most profitable sales territories, 112; increased help to dealers or retailers, 108; reducing wages and salaries, 106; application of market research to domestic markets, 104; opening of more wholesale outlets, 90, more retail outlets, 90; increased advertising, 90; revision of selling organization, 88.

In manufacturing, the relative order of importance of the measures cited in the 386 ballots is as follows:

Decreased production costs, 240; reduction of operating costs, 212; more research for new products, improvements, etc., 142; new machinery of higher capacity, 116; new processes, 102; revision of manufacturing layout, 86; new methods of shop management, 79; application of bonus or other wage incentive plans, 77; improved stores control, 63; increased safety work, 61; better factory lighting, 35; use of new equipment for moving materials, 20.

Old Age Pensions Called Employer's Responsibility

Old age pensions are seen as a definite responsibility of employers by the Committee on Employee's Retirement Annuities of the Chamber of Commerce of the United States. In a report to the Board of Directors the committee, of which REDFIELD PROCTOR is chairman, makes the following recommendations:

Regard for the personal interests of their employees, for the welfare of society in general, and for efficient administration of their own enterprises should prompt employers to develop some method for aiding in providing for the financial security of their superannuated employees.

The retirement of superannuated employees of long service on annuities is an aid to the profitable and efficient administration of business enterprise and is advantageous to employers, to employees and to the public. The annuity plan should provide for reasonable minimum payments.

The adoption of a definite retirement annuity plan should be given mature consideration by the management of every enterprise which has or is likely to have employees of long service, so that it may be in a position to make equitable provision for their eventual retirement.

Careful consideration should be given to the question of whether the entire expense of the retirement annuity plan should be borne by the employer, or whether the plan should contain provision for participation by the employees in the cost of the plan.

While the particular details to be made a part of a retirement annuity plan are affected by the nature of the enterprise, it is essential that definite provisions be incorporated specifying employees covered, retirement ages, service requirements, and the amounts payable upon retirement. Some provisions also should be included for the retirement, in the discretion of the management, of employees, who, because of disability, become incapacitated for further service.

Although the importance of a well-rounded employee thrift program is recognized, such a program cannot take the place of an adequate retirement system.

Funds which either employers or employees have paid into a contributory plan should be fully safeguarded either through insurance or trust funds. Even in the case of a non-contributory plan, it is important for the company to set aside and safeguard as fully as possible, a fund to cover its liabilities under the plan adopted.

A progressive step toward assuring the benefits of employees' retirement annuities to the large number of employees who do not remain with the same employer until reaching the retirement age, would be for employers having annuity plans to permit employees whose connection with the company is terminated after a reasonable period of service to retain their annuity credits, properly safeguarded, to help provide for their old age.

The adoption of public old age pension or relief acts should not deter employers from making provision for their own retired employees, since the trend of such legislation, in the United States, is in the direction of making provision solely for the care of aged and impoverished citizens, and is not ordinarily applicable to employees on the payrolls of private concerns. In view, however, of the trend throughout the world in pension legislation, every company annuity plan might well contain a provision that would enable employers to deduct from the annuities payable to their employees, any sums payable to these employees under public pension acts, except those arising out of employees' own contributions.

In so far as state or municipal old age pension or relief acts make possible the more humane and more efficient care of aged and impoverished citizens, such acts, when properly safeguarded by rigid eligibility requirements and restricted to the relief of the indigent, serve a valid social purpose and are not detrimental to the interests of American business.

X-rays in the new GE laboratory examine a 4-in. thick part for the mercury turbine power station being built there

New Year's Statement

F. A. MERRICK

President, Westinghouse Electric & Manufacturing Company

Any one wishing to forecast the future of industry at this time has only one item of speculation to deal with—namely, when the upturn in the business world may come. This, however, is the point on which very few aspire to prophesy. There are too many uncertain factors—uncertain in their measure because they have not been present in the same way in former business recessions. . . We have, however, the certainty that the period of stress through which we are passing is laying the foundation for greater and sounder progress in the future. Industry must recognize this as a period of wholesome — reconstruction. Those which first recognize the situation in this light will be the ones which profit most largely. They will profit in the way of better returns from the actual business of the immediate present and still more largely in the future.

The electrical industry is especially typical in this respect—possibly more than typical because of the great fields of adaptability still in view ahead. Electrical industry is fortunate in that its service is a foundation stone of every industrial structure.

Coming Up—"Round 1932"

ALFRED KAUFFMANN

President, Link-Belt Company

All year long we've "taken it on the chin." For the last three months we had to take many body blows too. But being good fighters we'v not yet had to take the count. And we're not going to take the count either. . . . This little holiday period is the end of round 1931. We're going to our corner to take the usual short rest, learn from our seconds how to size up our opponents, and when the gong rings and round 1932 is up we're going in determined to stay to the finish. . . .

Depressions are no new thing. While they bring anguish and sorrow and tears, they have also been schools. The present school, which opened late in 1929, we hope before long will close. To those who learned well what the school taught will come the rewards in the days that are ahead. The picture is not without its bright side. But let us face these facts:

There is no magic formula by which miracles may come to pass. Business will not change overnight, but in time it will be better.

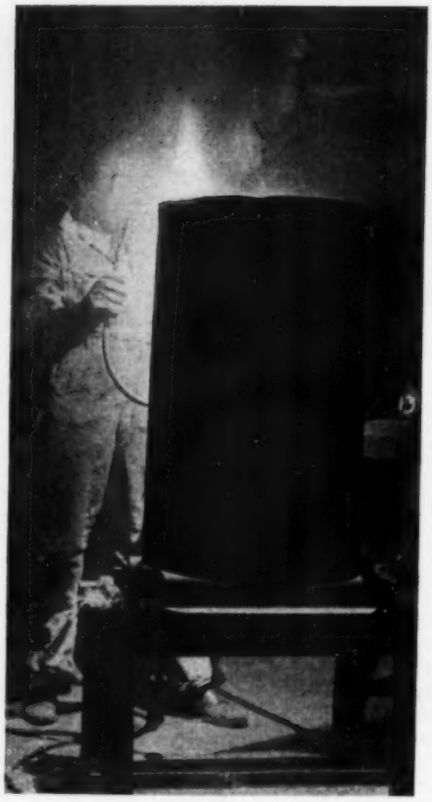
So as round 1932 is hung up, let us recognize that the desired objectives we constantly strive for, may be accomplished only by hard, consistent, endless work by us as individuals. There is no short cut, and we all know that is the truth.

The Electrical Industry in 1931

JOHN LISTON

General Electric Company

Developmental work in the electrical industry was continued actively throughout the year 1931, and improved efficiencies were secured in practically every class of electrical apparatus. Facilities for research work were increased by the construction of laboratory apparatus of higher powers and greater refinement; machinery designs were modified; and improved meterials utilized in their construction; and the field investigations of lightning, which have proved of such benefit to the power distribution systems of the country, were aided by newly developed instruments. . . . The year was notable for the progress made in electric transportation on both sea and land. . . . There was a marked increase in the number of equipments utilizing control systems actuated by photoelectric and electronic tubes for the control of lighting and power substations. These were, in many instances, applied to the direct control of industrial machinery.



Arc Welding in 1932

J. F. LINCOLN

President, The Lincoln Electric Co.

In spite of the general wailing over business conditions during the past two years any sort of a survey will reveal that many institutions have prospered. Such institutions are offering a service or product of real efficiency—value at low cost. Arc welding falls into this classification, for wherever the process is used, it has given an improved product, stronger and lighter, at lower cost. In the search for new economies, new methods of cutting production costs and profit protection, engineers and industrialists have turned to arc welding as an aid to efficient production, construction or repair. . . . 1931 saw the spread of the use of the shielded arc in welding. 1932 will bring the realization that this is the *only* method of securing super-strong connections.

In the field of machinery manufacture, we find more and more manufacturers taking advantage of the temporary lessening of demand by redesigning for arc-welded construction. As arc welding spreads in machinery construction the manufacturers become more adept in its application and the appearance of products so made improves. Here we discover another interesting if not pertinent fact. Those exponents of beauty in industry will find that arc-welded construction, which allows the use of flat, unbroken planes, is in all ways compatible with the features of modern design.

1932 will see an even greater spread of the applications of the process, for as industry regains its stride it will turn to the fabrication method of proven efficiency. As welding becomes more widely accepted and engineers become more familiar with its possibilities, shop and field practice will tend to become standardized. Code requirements will be more lenient. No one can tell what innovations will come from the laboratories and experimental shops. It is safe to assume that there will be a normal improvement in equipment and that the study of metals will open up new fields for the process. The shielded arc process will be improved to allow the use of larger diameter electrodes and further increase welding speeds and welding economy.

Exponents of welding now see the time approaching when manufacturers must adopt the process as a fabrication tool or be hopelessly defeated in the competitive battle for the attention of the market. 1932 should be the greatest year in the history of arc welding.

World Trade in 1931 and 1932

O. K. DAVIS

Secretary, National Foreign Trade Council

There have been three favorable elements in the world trade situation in 1931. The reduction in export trade from the year before has been less during the latter months than in the earlier part. Prices, especially in this country, have become more stable than at any time in the last two years. Some parts of the world, notably Japan, China and India, have actually bought larger quantities of goods from the United States in 1931 than they did in 1930.

Allowing for a general reduction in world prices of about 15 per cent, the world in general conducted in 1931 a little more than 85 per cent of its 1930 volume of trade. . . Our own participation in that decrease has been a little greater than the world's general average. Our shrinkage in exports for 1931 amounted to about 20 per cent from that of 1930, and was mainly felt in Latin America and, to a lesser degree, in Europe. . . . Our exports to Asia have maintained their level with remarkable persistency throughout the year, and in our sales to Japan, China and India we have actually done better than last year by 6 per cent. The notable event in foreign trade abroad has been Germany's succession to the position as second largest exporting nation in the world in place of England.

The most constructive aspect of the foreign trade situation is the fact that wholesale prices seem to have arrived at a relative stabilization in this country. In contrast to their fall of more than 11 per cent during the first half of the year, they have dropped only a little more than 2 per cent in the five months up to December 1. This represents a notable slowing down in the process of profitless merchandising toward which we appeared to be headed earlier in the year. Stable prices are the first requisite to recovery, and the foundation of that stability, it now appears, is at last being laid.

Railroad Performance in 1931

R. H. AISHTON

President of the American Railway Association & Chairman of the Association of Railway Executives

Railroads of this country, as they emerge from 1931, find themselves confronted with problems largely of a financial nature, due for the most part to the present business situation. . . . Present problems of the railroads can, however, be said to be due in part also to two other factors, including defects in the present regulatory system which prevent the railroads from building up their reserves in normal times, and lack of appropriate regulation, so far as interstate commerce is concerned, of the various agencies of transportation designed to bring about a complete and coordinated system of transportation embracing all land and water agencies. . . . In the matter of traffic, the year 1931 has been a sad disappointment. Earnings have correspondingly failed to improve. Preliminary reports indicate that loading of revenue freight in 1931 will total 37,250,000 cars, a reduction of 8,630,000 cars or 18.8 per cent under that for 1930, and 29.5 per cent under 1929. Measured in net ton miles, the volume of freight will probably show a reduction of 19.5 per cent under 1930 and 30.9 per cent under 1929. . . . Preliminary reports show Class I railroads with an operating return in 1931 of $534,000,000 or a return of 1.99 per cent on property investment as compared with the return of 3.36 per cent in 1930. . . . Passenger traffic was less than for any year within the last 27 years.

BUSINESS ITEMS

C. W. Marwedel Co., tool supplies company of San Francisco and Oakland, Calif., is now entering its sixtieth year of business. It was established in 1872 by the late C. F. MARWEDEL, in San Francisco, where the firm carried a stock of tools and metals. C. W. MARWEDEL is present owner of the firm, H. D. HEITMULLER, is general manager, ARTHUR MARWEDEL, assistant manager, and E. FERDINAND MARWEDEL, manager of the Oakland branch.

L. H. Gilmer Co., Tacony, Philadelphia, Pa., has just concluded its annual factory conference. Attending the meeting were over fifty men.

New Plants

A charter has been granted the Specialty Tool Corp., Joliet, Ill., to manufacture boring tools, chisels, electric hammers and similar tools, with ELMER J. HUBER, 11 Mississippi Ave., Joliet, as president. CARL H. SCHMIDGALL and JOHN L. HUBER, of Peoria, are associated with him as incorporators of the company which has $62,500 authorized capital. The company, which has a plant in Peoria, will transfer its operations to Joliet and will employ between 75 and 100 men. It has taken over the Specialty Sales Co., 655 Cass St., but the latter will continue to operate.

The Gibraltar Electric Clock Co., Inc., 66 Nassau St., New York City, has purchased the group of brick mill buildings in the block bounded by Communipaw & Bramhall Avenues, Woodward & Van Horne Sts., Jersey City, N. J., and will operate a plant there immediately, according to JOSEPH GOTTLIEB, president. The structures, which contain about 85,000 sq.ft. of floor space, were occupied until recently by the New York Standard Watch Service, a subsidiary of the Keystone Watch Case Co.

Associated Equipment Distributors of Seattle, Wash., celebrated their December meeting with a housewarming at "Machinery Mart," new $60,000 home of Pacific Hoist & Derrick Co. on Fourth Ave. South. F. R. SCHOEN is president of the company, and J. B. STAM president of the association.

All personal property of Perine Machinery Co., 419 First Ave. South, Seattle, Wash., has been purchased by Schnitzer & Wolf Machinery Co., and Zidell Steinberg Co., both of Portland, Ore. The new owners will liquidate the property.

Independent Lock Co., Fitchburg, Mass., expects to complete negotiations soon for the purchase of Lockwood Mfg. Co., Norwalk, Conn. The buyer expects to increase production at the Norwalk plant; also will have a plant nearer the New York market.

Eastman Kodak Co., Rochester, N. Y., has purchased, through Kodak A.G. of Berlin, Nagel Camera Works of Stuttgart. This acquisition is expected to strengthen greatly Eastman Kodak's hand in competing for European business. DR. AUGUST NAGEL remains as general manager of the Stuttgart factory.

According to D. H. CONVEY, head of Rolfe Iron Co., manufacturer of tubular specialties and playground equipment, Mason City, Iowa, F. C. HENEMAN has been appointed receiver for the firm through a district court order.

Moves and Transfers

SYDNEY B. CARPENDER, vice-president of Brunswick-Kroeschell Co., New Brunswick, N. J., manufacturer of air-cooling machinery, announced Dec. 22 that the Chicago plant would be moved to Newark and New Brunswick. Sales organization will be moved to Newark.

American Kron Co., New York, N. Y., has incorporated in Connecticut as Kron Co., Bridgeport, and has taken 20,000 sq.ft. of floor space at the Holbrook Brewster plant to start manufacturing early this month. Kron Co. holds 140 patents, including springless and automatic scales. Equipment will be moved from New York. RICHARD F. STRAW is president.

A further move on the part of the management of General Steel Wares to effect economies, is seen in the announcement that, effective Jan. 1, the Brantford (Ont.) plant of the Happy Thought Foundry Co. will be closed and the entire organization moved to London, Ont. The Happy Thought Foundry was one of the original companies going to make up General Steel Wares.

Directors of the Saco-Lowell Shops have voted to transfer the manufacturing operations now carried on in Newton Upper Falls to Biddeford and Saco, Me. The company has acquired several large buildings of the York plant in Saco, adjacent to its present plant in Biddeford and separated from it only by a channel of the Saco River which can be bridged easily at this point.

Dealers and Branches

Gears & Forgings, Inc., Cleveland, Ohio, has appointed the following jobbers for G & F speed reducers in their respective territories: Hardware & Supply Co., Akron, Ohio; Koontz-Wagner Electric Co., South Bend, Ind.; Stambaugh-Thompson Co., Youngstown, Ohio; Ross-Willoughby Co., Columbus, Ohio; Terre Haute (Ind.) Heavy Hardware Co., Inc.

Screw machines, turret lathes and automatic chucking machines manufactured by Foster Machine Co., Elkhart, Ind., is now handled in Chicago territory by Dean Machinery Co., assisted by Harry Lyon, a direct Foster representative for many years.

Federal Machine & Welder Co., Dana Ave., Warren, Ohio, has changed the address of its St. Louis office to 4116 Clayton Ave.

Halpin-Kohbry, Inc., 4116 Clayton Ave., St. Louis, has been appointed exclusive distributor in the St. Louis territory for Hobart Constant-Arc Welders.

General Supply & Equipment Co., 1419 Maryland Ave., Baltimore, Md., has been appointed exclusive representative in Baltimore and Washington for Hypressure Jenny, spray cleaning machine of Homestead Valve Mfg. Co., Coraopolis, Pa.

Lukens Steel Co., Coatesville, Pa., has announced appointment of Dravo-Doyle Co. as sales representative in the Pittsburgh territory for Lukens plates, flanged work and other products. Dravo-Doyle offices are in the Dravo Bldg., at 300 Penn Ave., Pittsburgh. McKee-Oliver, Inc., however, will continue to carry Lukens products in its warehouse stock at 1326 West Carson St., Pittsburgh.

Meyer-Ekstrom Co., Chicago, district representatives of Strong, Carlisle Hammond Co., Carling Turbine Blower Co., Q. P. Signal Co., and Craig Combustion Control, has moved to 565 West Washington Blvd., Chicago.

Canadian Stebbins Engineering & Mfg. Co., Ltd., 609 Drummond Bldg., Montreal, has been appointed sole Canadian representative of United States Stoneware Co., Akron, Ohio.

Lincoln Electric Co., Cleveland, Ohio, has located its Indianapolis sales office at 314 East 16th St., in the Architects & Engineers Bldg. R. D. EAGLESFIELD has been appointed district manager in charge of motor and welder sales, with headquarters there. Mr. Eaglesfield was formerly a manufacturer of motor-driven machinery, a pioneer in this field.

Wickes Brothers, Saginaw, Mich., have appointed Lloyd & Arms, 133 So. 36th St., Philadelphia, exclusive agent in the Philadelphia territory and Triplex Machine Tool Co., 50 Church St., New York City, in the New York territory, covering the entire line of Wickes engine lathes, crankshaft turning equipment and plate-working tools.

Fires

Fire did considerable damage recently at the plant of Warner Gear Corp., Muncie, Ind. Equipment stored in one end of a building, including machinery, was damaged. The fire was prevented from reaching the boiler room nearby, and plant operations will not suffer.

The Dubuque (Iowa) plant of Maizewood Products Co., manufacturer of insulating materials and building wallboard insulation from cornstalks, is to be rebuilt following a fire loss of $104,000 Dec. 7. Specifications are being prepared and the contract is to be let immediately.

Canadian Companies

Plans have been completed for the production of Pierce-Arrow automobiles at the plant of Studebaker Corporation of Canada, Walkerville, Ont., according to D. R. GROSSMAN, vice-president and general manager of the latter company. A new company will be organized for the Pierce-Arrow division as a subsidiary of Studebaker Corp. of Canada.

Trupar Mfg. Co., Dayton, Ohio, has established a 20,000-sq.ft. Canadian plant at Hamilton, Ont., for the manufacture of electric refrigerators and refrigerator bodies for motor trucks. The Canadian branch is to be known as Mayflower Co. of Canada, Ltd.

The large new iron and bronze foundry of Jenkins Bros., Ltd., at Lachine, Que., has been nearly completed. The plant is the first of three units to be constructed and consists of foundry and power house. The development is being carried out on a site of 500,000 sq.ft. Future plans call for two other units, comprising the machine shop, laboratory and research department. A total expenditure of approximately $2,000,000 is planned.

The National Battery Co., of Saint Paul, Minn., is likely to establish a Canadian branch factory in Winnipeg very shortly, following an inspection of possible sites by G. P. CASTNER, vice-president and general manager.

Burrard Drydock Co., Vancouver, B. C., has installed in its machine shop a 40-ton boring, drilling and milling machine, one of the largest on the Pacific coast. The machine, electrically-operated, was manufactured by Shanks at Johnstone, near Glasgow.

Additions to the Burnaby plant of the Dominion Bridge Co., near Vancouver, B. C., are practically completed. The new portion of the plant was designed and will be equipped for the processing of large-diameter steel pipe. The extension will step the capacity of the plant up to 600,000 tons monthly.

A 1,000,000-lb. cable-testing machine, stated to be the largest in existence, is now being installed at Toronto, Ont., by the Ontario Department of Mines, in a laboratory specially set aside.

• PERSONALS •

THOMAS F. MAHER has been elected president of Chapman Valve Mfg. Co., Indian Orchard, Mass., to succeed ADOLPH W. GILBERT, who resigned after 21 years as head of the company. He was previously head of the Pratt & Cady Co., Hartford, Conn. Mr. Maher, who was also with Pratt & Cady, has been with Chapman since 1911 and was made general manager a few months ago, after 12 years as sales manager.

A. J. BROWN, elected a vice-president of Royal Bank of Canada, is a director of Dominion Bridge Co., Ltd., Steel Co. of Canada, Ltd., Northern Electric Co., Ltd., vice-president of Dominion Engineering Works, Ltd., a director of Holt, Renfrew & Co., Ltd., and a director of several other Canadian enterprises.

GLEN F. HAWKEY has been elected vice-president of Cleveland Duplex Machinery Co., Inc., after being associated with the company for the last 14 years.

E. G. JONES, for six years general superintendent of the Wisconsin division of Inland Steel Co., at Milwaukee, has been transferred to the Chicago office in the inspection and metallurgical department. The Milwaukee rolling mills have been shut down and will not be reopened until business warrants.

GEORGE E. NICHOLS, formerly New York manager of Wright Mfg. Co., has joined Kron Co., Bridgeport, Conn., in an executive capacity.

AUSTIN C. Ross has resigned as works manager of Rolls-Royce of America, Inc., Springfield, Mass., and will be connected with Worthington Pump & Machinery Corp., New York City, where he will be associated again with HARRY C. BEAVER, formerly Rolls-Royce treasurer and now president of Worthington. Mr. Ross had been connected with Rolls-Royce twelve years. His duties will be taken over by HENRY S. KEYES, treasurer.

W. H. WOODIN has been elected president of American Car & Foundry Motors Co., to succeed C. S. SALES, resigned.

JOHN SPAULDING, plant superintendent of Collis Co., manufacturer of iron, wire and steel specialties, Clinton, Iowa, has resigned to become superintendent of the main plant of Nathan Mfg. Co., locomotive equipment, New York City. Mr. Spaulding has been associated with Collis for more than 19 years.

CHARLES B. TOWNSEND became superintendent of the Sycamore, Ill., mills of Anaconda Wire & Cable Co. Jan. 1, succeeding E. W. FLANSBURG, who has been transferred to Marion, Ind., where he will have similar position. W. H. MORLEY, also of the Sycamore plant staff, has been transferred to Pawtucket, R. I., as superintendent there.

Several executive changes have taken place in Fisher Governor Co., Marshalltown, Iowa, as the result of the annual meeting. J. H. FISHER, for two years chairman of the board of directors, is again president and resumes active management after being on the West Coast for five years because of ill health. L. W. BROWNE, president for the last two years, retains a stock interest, but has resigned to devote all his time to Kiowa Corp., and Ritchie Mfg. Co., both of Marshalltown, Iowa.

FREDERICK W. NEILSON has been elected president of Sikorsky Co., Stratford, Conn., a subsidiary of United Aircraft & Transportation Corp., New York. Mr. Neilson succeeds E. E. WILSON, now president of Chance Vought Corp., East Hartford, Conn., another subsidiary of United Aircraft. Mr. Neilson was formerly Siksorsky sales manager and vice-president.

LOUIS M. STONER, formerly president of Jacobs Mfg. Co., Hartford, Conn., has been elected chairman of the board of directors. HUBERT M. TOPPIN, former secretary-treasurer, succeeds Mr. Stoner as president. ARTHUR M. STONER was elected secretary. Mr. Toppin will continue as treasurer.

ERNEST M. STERNBERG has been elected president of Sterling Motor Truck Co., Milwaukee, to succeed R. G. HAYSSEN, resigned. He has been a member of the board of directors. H. C. KEENAN has been re-elected vice-president, and WILLIAM G. STERNBERG is a new vice-president. OSCAR HELD, treasurer, has been given additional duties as secretary, succeeding in the latter office C. G. HAYSSEN, resigned.

O. L. WILLIAMS, nephew of the late GEORGE A. WILLIAMS, president of Williams Sealing Co., Bloomington, Ill., has been elected president of the company, manufacturer of machines to produce sealing caps. O. L. SIMPSON was elected vice-president and treasurer. He was formerly treasurer and assistant secretary. J. T. WHITLEY is secretary and J. A. HEY, Chicago, assistant treasurer.

Speakers

WALTER N. POLAKOV, president of Walter N. Polakov & Co., Inc., New York, will discuss "Planning and Scheduling" at an informal management conference of the Metropolitan section, A.S.M.E., Jan. 6. The session will be sponsored by the Management Division. A. J. MOSES, of the Hedges-Walsh-Widner Co., Chattanooga, Tenn., will speak on "Welding Practice as Applied to Power Boiler Drums" at a joint meeting with the American Welding Society the preceding day. J. C. LINCOLN, of the Lincoln Electric Co., Cleveland, will speak on "The Shielded Arc," and F. G. SHERBONDY, vice-president of Biggs Boiler Works, Akron, will speak on "Requirements to Conform with New Welding Code" at the same meeting.

Four engineers of the Westinghouse Electric & Mfg. Co. have been asked to present technical papers at the International Electrical Congress, in Paris, France, in June, 1932. They are: J. SLEPAIN, on "Interruption of Power Arcs"; C. L. FORTESCUE, who will discuss "Lightning and Its Effects," and R. D. EVANS and C. WAGNER, who will discuss "Stability of Power Systems" together. Such a congress was held in Paris in 1881. This is to be in commemoration of the first.

CAPT. D. N. HOUSMAN, of the Ordnance Dept., U. S. A., will speak on "Industrial Preparedness and New Ordnance Development" at the Jan. 11th meeting of the Birmingham local section, A.S.M.E., at the Auditorium Alabama Power Bldg.

Sales Staffs

R. H. BALL, for a number of years connected with Warner & Swasey Co. in the Michigan and Northeastern Ohio territory, is now affiliated with Cleveland Duplex Machinery Co., Inc., as sales engineer.

C. B. CROCKETT and R. L. SMITH have been appointed Eastern general sales agents for the line of electric industrial trucks, tractors and cranes of Automatic Transportation Co., Inc. Centralized sales and engineering headquarters will be at 504 Lexington Ave., New York City, with district offices at Boston, Hartford, Buffalo, Newark, Philadelphia, Pittsburgh, Washington, Baltimore and Charlotte, N. C. Mr. Crockett has been executive secretary of the Industrial Truck Assocation since its formation; Mr. Smith was connected with the Elwell-Parker Electric Co.

WILLIAM GROVE, formerly with the Ingersoll Milling Machine Co., Rockford, Ill., joined the Sales Engineering department of William Sellers & Co., Inc., Philadelphia, Pa., as of Jan. 1, to specialize on planer-type milling machines and floor borers.

CHESTER H. LANG, formerly assistant manager of the publicity department, then comptroller of the budget, General Electric Co., has been appointed manager of the publicity department to succeed MARTIN P. RICE, who retired Dec. 31, after more than 37 years of service.

CLARENCE E. SEARLE, general representative of Allis-Chalmers Mfg. Co., Milwaukee, has resigned, effective Jan. 31. He will be succeeded as general representative by L. W. GROTHAUS, assistant manager of the electrical department. Mr. Searle has been associated with the company for 24 years, and for the last 18 has directed its entire sales activities.

MERTON R. SUMNER, formerly with Byllesby Engineering & Management Co., Pittsburgh, has been appointed manager of the Chicago sales office, 718 Madison Terminal Bldg., of Rockbestos Products Corp., New Haven, Conn. Rockbestos manufactures insulated electric wires and cables for severe service.

W. H. WASHBURNE has been placed in charge of a new fleet sales division for Aluminum Industries, Inc., Cincinnati. He has been district manager of the industrial sales division in midwestern territory.

JOSEPH VIALL, district manager of Steel Sales Corp., at Milwaukee, has been elected president of the Sales Managers' Association of Milwaukee.

• OBITUARIES •

HERBERT L. ANDERSON, 44, chief examiner of the Federal Trade Commission, died Dec. 29, in Washington, following a brief illness.

KNOWLTON L. AMES, SR., 62, chairman of the finance committee, Murray Corp. of America, Detroit, director of American Steel Foundries and chairman of Booth Fisheries Co., Chicago, died there Dec. 23.

HENRY H. BARBOUR, 70, formerly vice-president of the Lackawanna Steel Co., died in Philadelphia Dec. 28 after a lingering illness. Mr. Barbour joined Carnegie Steel in 1884 after graduation from the University of Illinois. He later went to the Lackawanna Steel at Buffalo, being elected vice-president after the World War. He acted in that capacity until Lackawanna merged with Bethlehem.

GEORGE S. BENEDICT, for many years associated with the late S. J. BENEDICT and PAUL BENEDICT, in the operation of Salamanca (N. Y.) Foundry Co., died recently in Cleveland, Ohio, following a brief illness. Salamanca Foundry was absorbed some years ago by Salamanca Luminite Works.

ARTHUR E. HODGSON, assistant treasurer of Winchester Repeating Arms Co., New Haven, Conn., committed suicide Dec. 24. Mr. Hodgson was secretary-treasurer of Winchester previous to its purchase by Western Cartridge Co., and reorganization. He started with the company as paymaster.

ELWYN W. LOVEJOY, 81, of D. Lovejoy & Sons Co., Lowell, Mass., and Anderson (Ind.) Knife & Bar Co., died Dec. 26, after a long illness.

BRADISH P. MORSE, 60, treasurer of the Morse Brothers Machinery & Supply Co., Denver, Colo., died at his home Dec. 27 of heart disease aggravated by a severe cold.

SCOTT H. PENFIELD, 68, formerly president of the Salisbury Axle Mfg. Co., died suddenly Dec. 28, at Jamestown, N. Y.

THOMAS B. PRITCHARD, 65, president of the Rochester (N. Y.) Chemical Co., died recently at his home.

DR. JOHANNES GEORG REINECKER, head of J. E. Reinecker, A.G., Chemnitz, Germany, died there Dec. 8. He took a very active part in all of the activities of German machine tool builders and was known in machine-tool circles throughout the world.

ROY W. ROUNSEVILLE, 46, associated with Wallworth Co., Kewanee (Ill.) plant, since 1906, manager of the plant in recent years, died suddenly Dec. 26, following cerebral hemorrhage.

FRANK C. SIBLEY, 39, superintendent of the South Bend (Ind.) Foundry Co., recently was found dead in his offices. He had been connected with the company all his business life. His brother, WILLIAM C. SIBLEY, is president and treasurer.

WILLIAM ANDREW STEWART, 84, retired machine shop and foundry operator of Nashville, Tenn., died there Dec. 26 after a fall sustained a month ago. A member of Stewart & Bruckner for a decade prior to its dissolution in 1917, he had been retired since that time.

ARTHUR VON GWINNER, 75, for more than forty years one of the leading German bankers and active in the development of European railroads, died Dec. 29 at his home in Berlin.

THOMAS WREN, 94, retired foundry superintendent of Peekskill, N. Y., died there Dec. 22.

WILLIAM A. YOUNG, 61, for 20 years associated with the Harnischfeger Corp., Milwaukee, as chief and consulting engineer, died Dec. 23.

• MEETINGS •

NATIONAL AUTOMOBILE SHOW
New York, Grand Central Palace, Jan. 9-16; Chicago, Coliseum, Jan. 30-Feb. 6.

STEEL FOUNDER'S SOCIETY OF AMERICA, INC.
Annual meeting, Chicago, Ill., Jan. 21, 1932. G. P. Rogers, managing director, 932 Graybar Bldg., New York City.

NATIONAL ASSOCIATION OF ENGINE & BOAT MANUFACTURERS
Motorboat and marine engine show, Grand Central Palace, New York City, Jan. 22-30, 1932. Henry R. Sutphen, president.

SOCIETY OF AUTOMOTIVE ENGINEERS
Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 25-29. John A. C. Warner, secretary, 29 West 39th St., New York, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Winter meeting, Engineering Societies Bldg., New York, N. Y., Jan. 25-29. F. L. Hutchinson, secretary, 33 West 39th St., New York City.

SECOND INTERNATIONAL HEATING & VENTILATING EXPOSITION
Sponsored by American Society of Heating & Ventilating Engineers, in conjunction with A.S.R.E., American Oil Burner Ass'n, and National Warm Air Heating Ass'n. Cleveland Auditorium, Cleveland, Ohio, Jan. 25-29.

AMERICAN MANAGEMENT ASSOCIATION
Packaging, packing and shipping exposition Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., New York, N. Y.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention. American Foundrymen's Ass'n. Philadelphia Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Long Beach—City will soon award contract for construction of a 3 story, 60 x 120 ft. public utility building including garage at Broadway and Pacific Blvd. Estimated cost $90,000. Dedrick & Bobbe, 901 Heartwell Bldg., Archts. and Engrs. Noted December 31.

Calif., Los Angeles—Board of Education, will soon award contract for addition to high school including manual training shop. Estimated cost $85,000.

Calif., San Diego—Pacific Telephone & Telegraph Co., 9th and C. Sts., awarded contract for construction of a 1 story, 100 x 200 ft. garage at Eighth and G. Sts.

Calif., San Diego—Southern California Telephone Co., 740 South Olive St., Los Angeles, awarded contract for construction of a 1 story, 100 x 200 ft. garage building at 10th Ave. and G. St. Estimated cost $45,000.

D. C., Washington—D. C. Commissioners, will soon award contract for alterations and extensions to repair shop at 16th and You Sts. Estimated cost $25,000.

Ind., Peru—Chesapeake & Ohio Railroad Co., Richmond, Va., awarded contract for consrtuction of a 1 story, 30 x 190 ft. shop and engine house here. Estimated cost $40,000. C. W. Johns, Richmond, Ch. Engr. Noted December 3.

Ia., Cedar Rapids — T. M. Sinclair Co., awarded contract for alterations to factory at Third St. and 16th Ave. Estimated cost $62,000.

Ia., Dubuque—Maizewood Products Corp., will soon receive bids for rebuilding plant destroyed by fire. Estimated cost $150,000. Noted December 24.

La., Harvey — Continental Can Co., 1 Pershing Sq., New York, N. Y., preparing plans and specifications construction of a can manufacturing plant here. Estimated cost to exceed $100,000. Favrot & Livandais, Hibernia Bldg., New Orleans, Archts.

Mass., Charlestown (sta. Boston—Kalman Steel Corp., 75 Federal St., Boston, will build a 2 story warehouse on Rutherford Ave. here. Estimated cost $40,000. Private plans. Work will be done by day labor.

Mass., Middleton—Essex County Commission, Court House, Salem, plans construction of a 2 story service building at County Sanatorium, Ashton, Hunters & Alter, 477 Essex St., archts.

Mass., Quincy — Campbell Machine Co., 39 Hayward St., plans additions and alterations to factory. Estimated cost to exceed $40,000. Private plans.

Mass., Reading—Ace Art Co., 12 Gould St., receiving bids for a 1 and 2 story addition to factory. Estimated cost $40,000. D. J. Abrahams, 260 Tremont St., Boston, Archt. Former bids rejected. Noted December 3.

Mass., Springfield—Goodyear Tire & Rubber Co., preparing plans for construction of a 1 story automobile service station at Main and Gardner Sts. Estimated cost to exceed $40,000. Private plans.

Mich., Detroit—Long Mfg. Co., 2768 East Grand Blvd., awarded contract for a 1 story addition to plant for the manufacture of automobile radiators, etc. $35,000.

Minn., Minneapolis—City Water Department, W. B. Heath, Supervisor, awarded contract for construction of 2story meter repair shop at Third St. S. between Second and Third Aves. $51,300. Noted December 17.

Mo., Kansas City—Beebe Transfer Co., 644 Brooklyn Ave., plans construction of a 1 story repair shop.

N. J., East Orange—K. W. Dalzell, 263 Central Ave., Archt., will receive bids until February 21 for construction of a 2 story garage and showroom for Owner c/o Archt. Estimated cost $150,000. Noted December 24.

N. J., East Rutherford — East Rutherford Syringe Co., 75 Mozart St., having revised preliminary plans prepared for a 2 story factory at 54 Mozart St. Estimated cost $50,000. J. T. Camlet, 26 Piaget Ave., Clifton, Archt.

N. J., Rutherford—Jersey City & Lyndhurst Bus Co., M. Englander, 270 Oriental Pl., Lyndhurst, plans construction of a 2 story bus terminal and garage here. Estimated cost $150,000. Architect not selected.

N. Y., Avon—Peter L. Zifka, plans converting knitting mills into storage, display rooms and service building for trucks and tractors.

N. Y., Brooklyn—Board of Education, Municipal Bldg., New York, plans addition to manual training high school at Seventh Ave. and Fourth St. here. Estimated cost $960,000.

N. Y., Brooklyn—Bureau of Public Buildings & Offices, Borough of Brooklyn, having sketches made for a 1 story, 60 x 100 ft. metal storage and service building at Hamilton Ave. and South 74th St. J. M. Coleman, 341 Madison Ave., New York, Archt.

N. Y., Brooklyn—Department of Hospitals, Municipal Bldg., New York, plans construction of a 2 story addition to garage and service building at Cumberland Hospital, Cumberland St. and Myrtle Ave., here. Estimated cost $50,000. C. B. Meyers, 31 Union Sq. W., New York, Archt.

N. Y., Brooklyn—Realty Associates, 162 Remsen St., will build a 3 story addition to service garage and gas station on Calm St. Estimated cost $100,000. B. Friesler, Jr., 153 Remsen St., Archt. Work will be done by separate contracts. Project pending grant of permit. Noted December 17.

N. Y., Brooklyn—Refined Macaroni Co., 421 Rodney St., is receiving bids for construction of a 37 x 100 ft. service garage and shop building at Hope St. and West Rodney St. Laspia & Samenfeld, 217 Havemeyer St., Archts.

N. Y., Jamaica—N. Morcrief, 110-31 153rd St., is having sketches made for a 1 story, 38 x 100 ft. repair shop at 111th Road and 153rd St. Private plans.

N. Y., Long Island City—George U. Harvey, Pres. Queens Borough, Queens Subway Bldg., completed plans for a 40 x 170 ft. repair and service shop at 32nd Ave. and Downing St.

N. Y., Middletown—New York Ontario & Western Ry. Co., 370 Lexington Ave., New York, plans to rebuild carpenter shop, car repair shop and part of machine shop here destroyed by fire. Loss $300,000. W. C. Heidenthal, Engr. Maintenance and Ways.

N. Y., New York — John Bradley Inc., 19 Beach St., preparing plans for construction of a 75 x 100 ft. service garage at 555 Greenwich St. J. C. Hankinson, 74 Varick St., Archt. Noted December 31.

N. Y., New York — Simon P. Emory, 277 Broadway, having sketches made for a 1 story, 48 x 100 ft. service building and gas station at Westchester and Metcalf Ave. J. M. Baker, 9 Jackson Ave., Long Island City, Archt.

N. Y., New York—Jacob Smith, 291 Minniford Ave., having sketches made for a 20 x 49 ft. garage and repair shop at City Island Ave. and Tier St. George S. Miller, 319 City Island Ave., Archt.

N. Y., Queens Village—Cypress Homes Co., 582 Jane Ave., Brooklyn, plans construction of a service garage and gas station at Rockaway Blvd. and West 75th St. Estimated cost to exceed $25,000. J. Baker, c/o owner, Archt.

O., Columbus—Borger Bros. Boiler Works, c/o E. E. Folmer, 257 West Spring St., will soon award contract for a 1 story, 70 x 160 ft. repair and service garage. Bassett & Tresselt, 257 East Broad St., Archts.

O., Toledo—J. Leonard Rusk, 241 Sixteenth St., Archt., preparing plans for a 1 story, 35 x 250 ft. industrial plant. Owner's name withheld.

Pa., Altoona—Pennsylvania R.R., Broad St. Station, Philadelphia, plans to rebuild machine tank, bolt and miscellaneous shops, destroyed by fire here. Loss $1,500,000. T. J. Skillman, Philadelphia, Ch. Engr.

Pa., Buffalo—Westinghouse Electric & Mfg. Co., East Pittsburgh, awarded contract for a 2 story, 112 x 360 ft. plant including shop, distribution building, etc., here. Estimated cost $100,000.

Tex., Austin—Board of Regents, University of Texas, c/o J. W. Calhoun, Comptroller, will receive bids until January 29 for a group of buildings including engineering building, etc., on University campus. Estimated total cost $2,400,000. Herbert M. Greene, La Roche & Dahl, Insurance Bldg., Dallas, Archts. R. F. Taylor, Santa Fe Bldg., Dallas, Mech. Engr., and Matthews & Neenan, Smith-Young Tower, San Antonio, Struc. Engrs. Noted December 3.

Ont., Burlington—Niagara Brand Spray Co., of a new plant. Estimated cost $50,000.
of a new plant. Estimated cost $5,000.

Ont., Chatham—R. D. Walsh Co. Ltd., plans to rebuild woodworking plant recently destroyed by fire. $50,000. Machinery and equipment will be installed. Work will start at once.

Ont., Point Edward—Art Mantles Co. Ltd. of Toronto, manufacturers of artistic mantles, fire place and home decorations, plans construction of a 30 x 100 ft. plant here, to be operated in conjunction with Sarnia Cement Products Ltd.

Que., St. Lambert—L. E. Waterman Fountain Pen Co. Ltd., St. Lambert, and 191 Broadway, New York, plans addition to plant here. Estimated cost to exceed $40,000.

Equipment Wanted

D. C., Washington—Bureau of Supplies & Accounts, Navy Dept.—will receive bids until January 12 for two motor driven engine lathes for Navy Yard, New York, or San Francisco, Calif. Sch. 7158.

D. C., Washington — District Commissioners, will receive bids until January 14 for two lathes, three planers and jointers, four saw benches, four sanders and work benches for public schools.

Mass., Malden (br. Boston)—Owner, 50 Barrett St.—machine lathe and small woodworking equipment.

Ont., Brantford—Sussex Bitumen Co. of London, England—machinery and equipment for the manufacture of bitumen products for recently acquired building here.

Va., Hampton Roads (br. Norfolk)—Bureau of Supplies & Accounts, Navy Yard, Washington, D. C., will receive bids until January 12 for die making machine, combination grinder and buffer machines, universal testing machine, brake shoe grinding machine, drilling machine, drill poiter machines, all motor driven for Navy Yard here.